

Annual AVMA Meeting

Denver, Colorado

August 14-18, 1960

Journal

OF THE
**AMERICAN VETERINARY
MEDICAL ASSOCIATION**

Canine Angiocardiography

UTILIZATION of a rapid film change technique for diagnosing dirofilariasis is described. Page 355

A WELL-ILLUSTRATED REPORT interprets normal left lateral angiograms. Page 359

Lungworms in Swine

EFFICACY of a therapeutic agent for treatment of *Metastrongylus* helminths is evaluated. Page 366

Parakeet and Canary Practice

A PRACTITIONER describes his methods of treatment of diseases of pet birds. Page 378

Who Runs the AVMA?

A MUCH DEBATED QUESTION concerning people who hold AVMA offices is answered by a former executive-secretary. Page 398



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Journal

OF THE
AMERICAN VETERINARY
MEDICAL ASSOCIATION

Vol. 136 No. 3 April 15, 1960

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Correspondence

February 25, 1960

Dear Sir:

In the February 15 issue of the AVMA JOURNAL, you have an abstract on page 170 on the removal of radioactive strontium and cesium from milk. The last statement in your article reads: "It is not known if this can be done on a large scale basis."

Three agencies, the Atomic Energy Commission, the Department of Health, Education, and Welfare, and the Department of Agriculture, are jointly planning to combine their efforts and financial support to tackle this problem. Additional laboratory research is in progress in the Agricultural Research Service. A staff is being organized and equipment assembled to adapt the laboratory findings to a pilot plant operation at the Agricultural Research Center at Beltsville, Md.

s/ FRANK A. TODD, D.V.M.

Assistant to the Administrator
ARS, USDA, Washington 25, D. C.



February 18, 1960

Dear Sir:

I wish to refer to the article, "Coccidioidomycosis from Man to Dog," published in your JOURNAL of Feb. 1, 1960, page 103. The title of this article strongly infers that the dog picked up this disease as a result of having been in contact with her owner.

I would like to point out that this disease is not transmissible from one living animal to another, but it is contracted from inhalation of the spores from dust. This dog, as well as her master, was in an area enzootic for coccidioidomycosis.

Because there is quite a misunderstanding among professional people regarding this disease, I do feel it is important to make this correction in your JOURNAL.

s/John L. Hinds, D.V.M.
Tucson Small Animal Hospital
Tucson, Ariz.

[Editor's Note: Dr. Hinds' point is well taken. The title was misleading. Coccidioidomycosis is not transmissible.]



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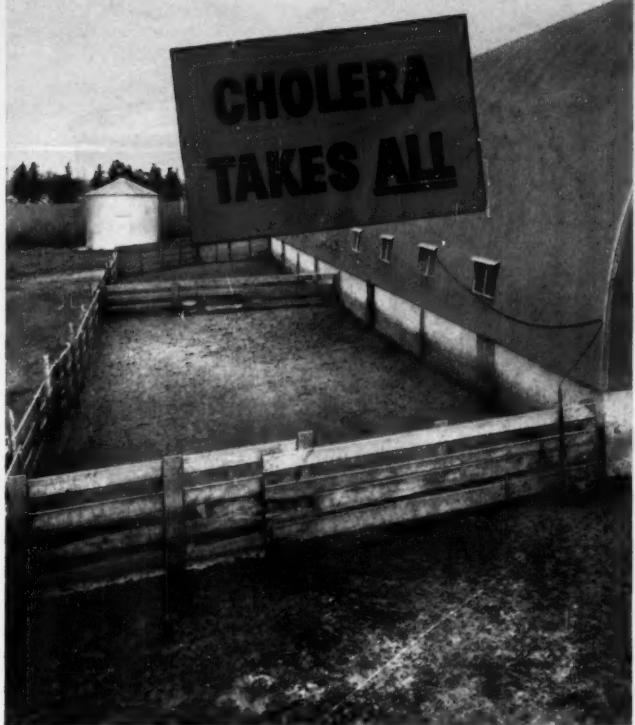
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Reduction of two-page 'Spread'



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but all the corn, care and cash
you've put in them!**



**consult your
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he knows best—
what's best

If you lose just a few pigs on a
slim profit—may be you're
gambling with cholera. But chol-
era takes more—the pigs, the
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spring. Just when most farmers
have their money invested in
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those pigs. It's the high investment in
feed, time and housing. That's what makes
cholera so costly.

Cholera is a threat the year 'round. It can
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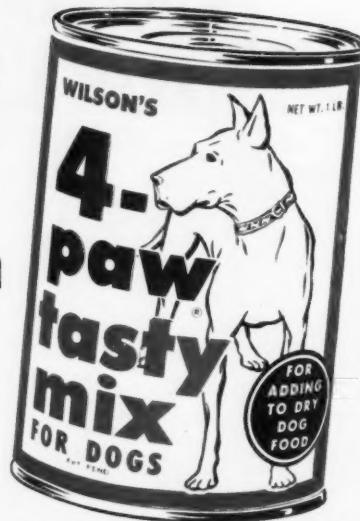
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2:12 P.M.

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*Gorman, T.N.: J.A.V.M.A. 134:564
(May 15) 1959.

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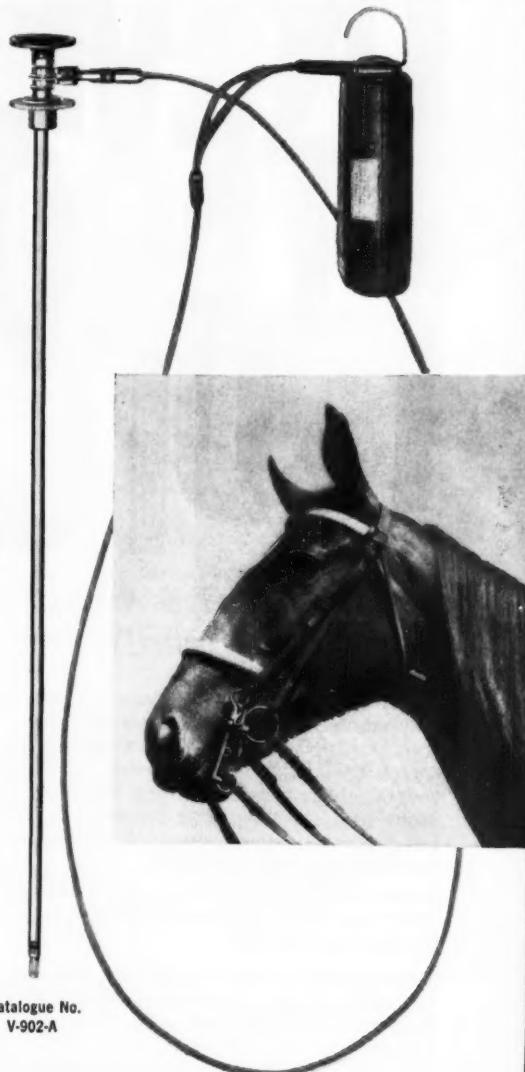
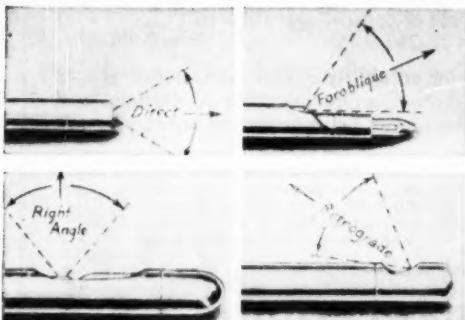
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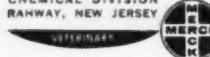
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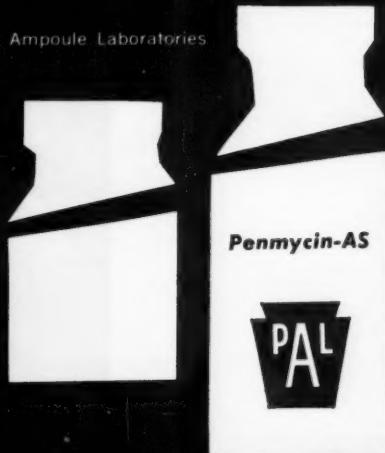
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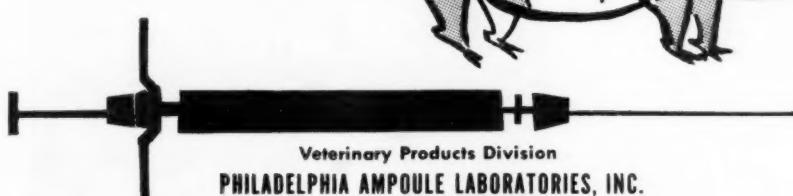
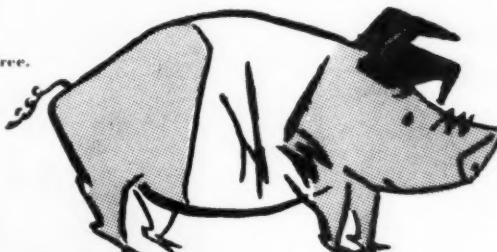


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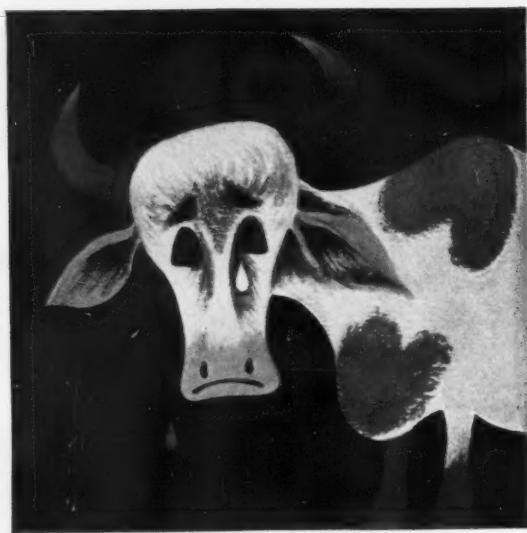


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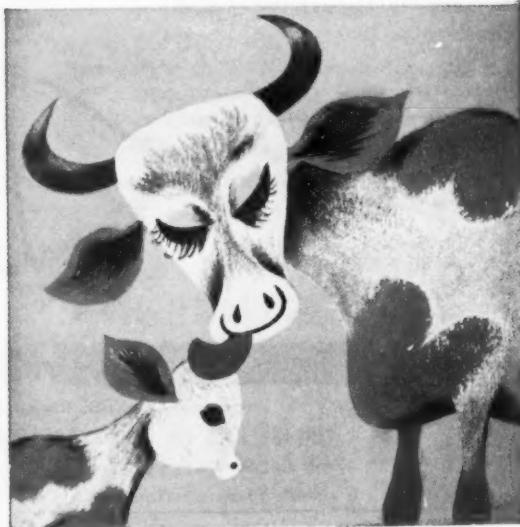
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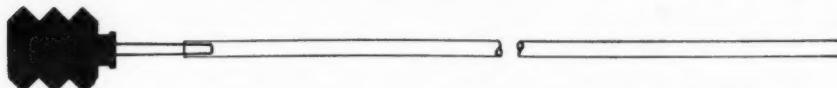
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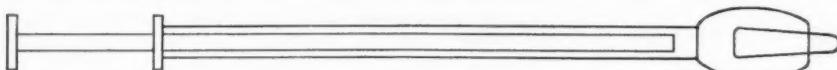
In a study with 85 subfertile dairy cows, 61.7% of 34 treated with an intra-uterine injection of FURACIN Solution Veterinary conceived at first service, while only 19.3% of 31 treated in an identical manner with 10% saline solution conceived at first service; 40% of 20 non-treated controls conceived at first service.²

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- 1.Vigue, R. F., et al.: J. Am. Vet. M. Ass. 134:308 (April 1) 1959.
- 2.Vigue, R. F.: Personal communication.

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FROM THE AVMA WASHINGTON OFFICE

J. A. McCallum, VMD
Brig. Gen. USA (Ret.)

LEGISLATIVE

House Passes PHS Personnel Act

Public Health Service Commissioned Corps Personnel Act 1960 (S. 2220) passed House March 9 (see JOURNAL, Aug. 1, 1959, adv. p. 14).

Food, Drug, Cosmetic Act Gets Favorable Report

Subcommittee Health and Safety of the House Interstate Commerce Committee, favorably reported to full committee H.R. 7480 to amend Food, Drug, and Cosmetic Act, with respect to label declaration of use of pesticide chemicals on raw agricultural commodities which are produce of the soil (see JOURNAL, July 15, 1959, adv. p. 12).

Congress Urged to Investigate Importation and Quarantine

Resolution Intermountain VMA and Western States Livestock Sanitary Officials, Jan. 22, 1960, printed in Congressional Record Mar. 15 at request Sen. Bennett (Utah), requests Congress to recognize and investigate (1) entire matter of imports of sheep, cattle, and other animals, (2) adequate quarantine facilities for animals and birds to be established on Pacific Coast and necessary funds provided, and (3) prohibition of importation of animals from foreign countries for purposes other than immediate slaughter until adequate facilities are provided.

NEW BILLS

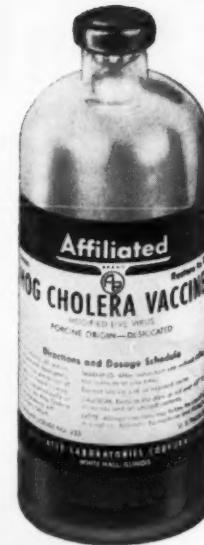
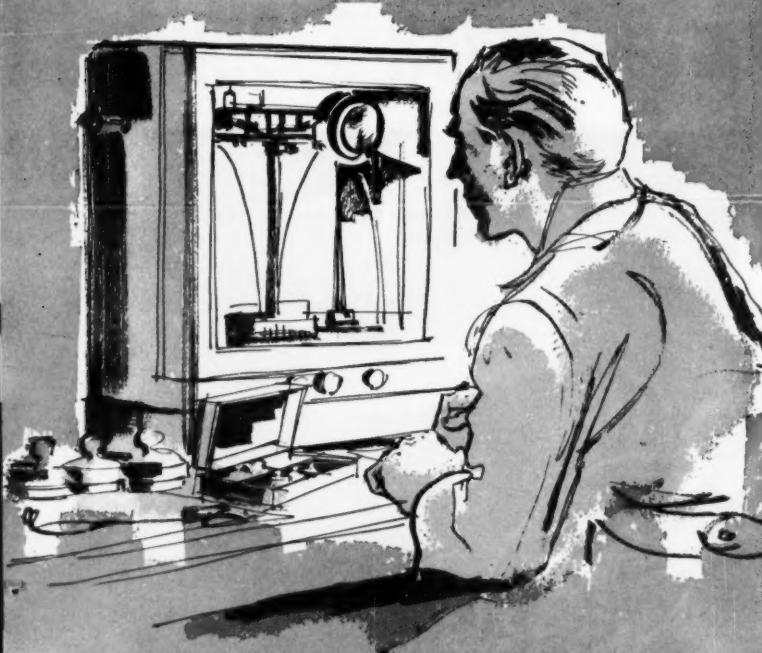
Health Research and Training

H. J. Res. 649—Rep. Roberts (D., Ala.). A compromise version of Senate-passed S. J. 41; pertains to international health research and training (see JOURNAL, Aug. 1, 1959, adv. p. 12). Roberts "clean bill" (1) authorizes \$10 million a year in appropriated funds, instead of \$50 million, but permits government to use unlimited amounts of foreign currencies made available to U.S. in return for agricultural products, (2) gives State Department greater role yet authorizes the President to delegate such powers as he deems fit to DHEW, (3) permits HEW to carry out responsibilities to create "an appropriate administrative office or unit," in lieu of authority to establish a special unit in NIH, and (4) clarifies and widens authority of U.S. to finance research projects and fellowships in foreign countries, interchange exports, and loans or grants for purchasing equipment.

USDA Employee Compensation

S. 3202—Sen. Yarborough (D., Texas). To provide extra compensation for Sunday or holiday work by USDA employees performing inspection or quarantine services.

(continued on adv. p. 20)



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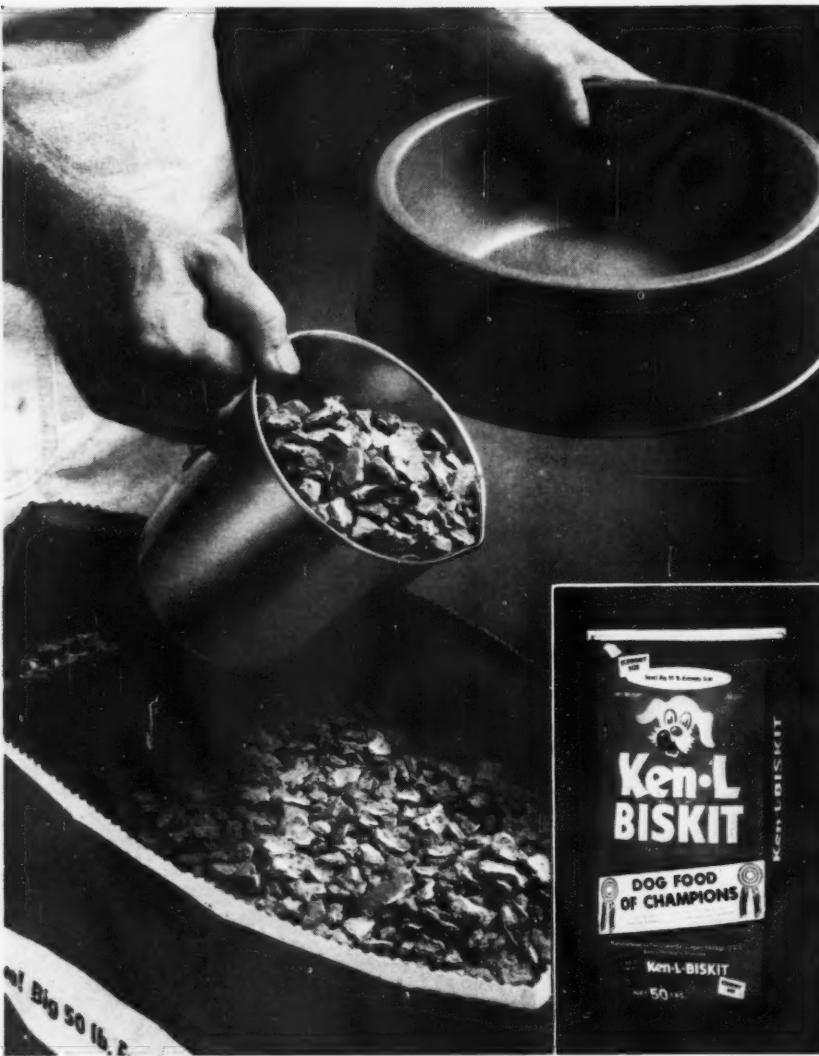
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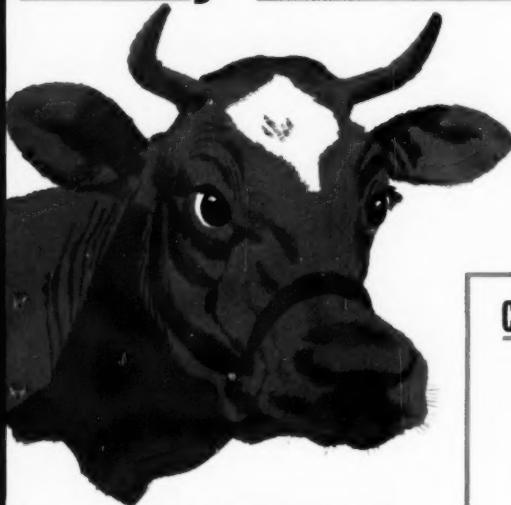
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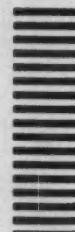
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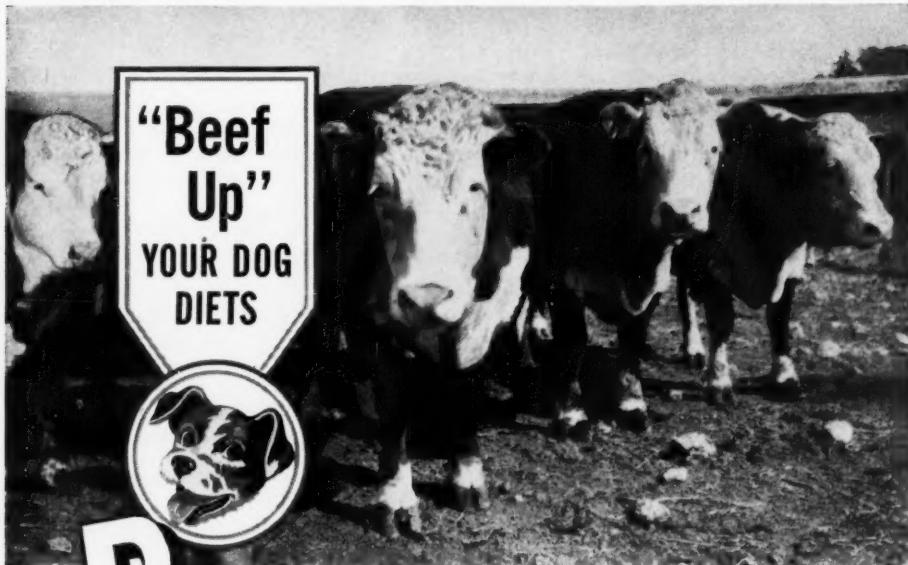
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WASHINGTON NEWS—Continued

Federal College Loans

H. R. 10942—Rep. Dent (D., Pa.). Authorize federal loans to colleges and universities for construction, rehabilitation, alteration, and conversion of classroom buildings and other academic facilities.

MISCELLANEOUS

USDA Meat Hygiene Training Center Opened in Chicago

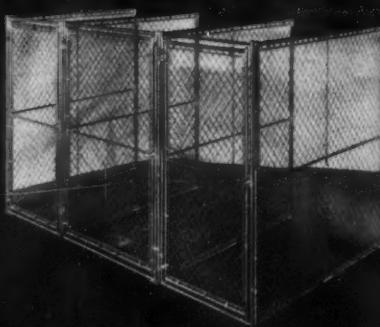
USDA opened a Meat Hygiene Training Center April 4 to expedite and systematize training of federal meat inspectors, veterinarians, and laymen. It is located in International House, University of Chicago campus, and is under direction of Dr. J. D. Lane. Instructors will include ARS specialists and, for selected subjects, representatives from industry, research organizations, and educational institutions.

Brucellosis Tests Proved Successful in Washington

Method of testing range cattle in brucellosis eradication program is based on screening-type blood test of cull and dry cows on way to or during slaughter; also, owners required to vaccinate at least 80 per cent of all eligible calves, which has proved successful as result of 3 years' use in state of Washington, according to USDA.

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a "Post" on Peter Dunn's Ghost



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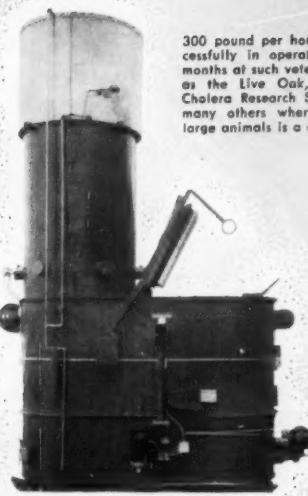
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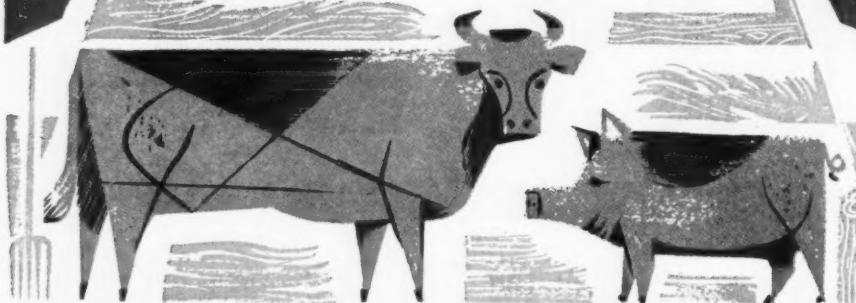
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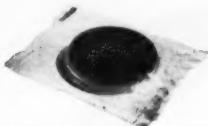
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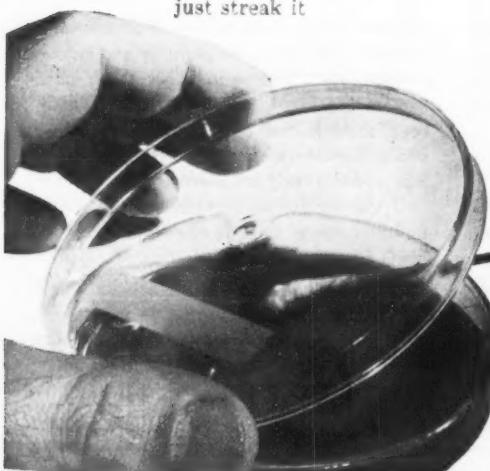
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Vol. 136

No. 8

April 15, 1960

OF THE
AMERICAN VETERINARY
MEDICAL ASSOCIATION

Angiocardiography in

Canine Dirofilariasis

II. Utilization of a Rapid Film Change Technique

ALLEN W. HAHN, D.V.M.

PRESENT RADIOLOGIC techniques are inadequate to demonstrate effectively the changes in the cardiopulmonary circuit caused by the canine heartworm *Dirofilaria immitis*. Earlier studies at this institution^{4,5} have utilized angiocardiography to evaluate this aspect. The purpose of this report is to present results of preliminary studies using a technique of rapid film change to demonstrate the contrast medium throughout most of its progression through the cardiopulmonary circuit.

Angiocardiography may be defined as radiologic visualization of the heart and great vessels using an intravascular contrast medium. Since its clinical practicability was first reported in 1938,⁷ it has become a widely used radiologic method in recent years. It has gained particular favor in diagnosis and surgical evaluation of congenital cardiovascular anomalies in man, and it has been advocated with various modifications for the diagnosis and

prognosis of acquired valvular lesions,⁸ coronary artery disease,³ and mediastinal and pulmonary neoplasms.^{2,6}

With the advent of more refined instrumentation, such as rapid film changing devices and cinefluoroscopy, a more complete understanding of the radiographic features of cardiovascular dynamics has been made possible. It is hoped that this report will stimulate further interest in radiologic evaluation of canine dirofilariasis.

Materials and Methods

In this study, 14 mongrel dogs were utilized. They were obtained from an area of high *Dirofilaria* incidence and were 1 to 10 years old as determined by dental examination. These dogs were infected with *D. immitis* as determined by positive identification of microfilariae in the peripheral circulation.*

These animals were also utilized in a related project to evaluate surgical removal of *Dirofilaria* via pulmonary arteriotomy.⁹ Because of this surgical study, it was possible to draw conclusions regarding

Dr. Hahn is research assistant, Department of Small Animal Surgery and Medicine, School of Veterinary Medicine, Auburn University, Auburn, Ala.

This project was supported by funds from the Scott Research Grant, Auburn Research Foundation, Auburn, Ala.

This article appears as paper No. 842 approved by the Committee on Publications, School of Veterinary Medicine, Auburn University.

*Dr. J. R. Lindsey, Department of Pathology and Parasitology, School of Veterinary Medicine, Auburn University, conducted all the identification studies on the microfilariae.

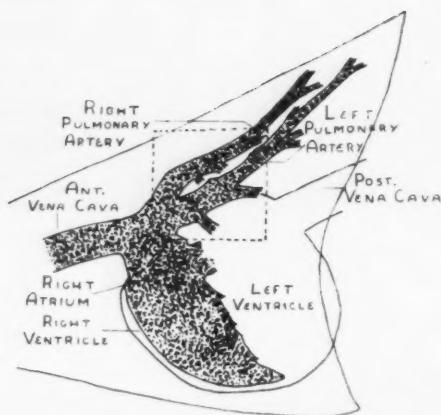


Fig. 1—Schematic drawing of the right lateral recumbent angiogram. Relative positions of pulmonary arteries and right ventricle are shown. The area within the broken lines represent the area included in figures 2, 3, 4, and 5.

radiologic changes before and after removal of the worm masses.

Angiocardiography was performed at least 2 days and, in several cases, up to 4 days prior to surgery and again 20 to 28 days following surgery.

To facilitate restraint during angiography, the dogs were anesthetized with intravenous pentobarbital sodium and positioned in left lateral recumbency. A 14- to 17-gauge needle, 2 inches in length, was inserted percutaneously into the cephalic or jugular vein. Fixation of the needle within the lumen of the vein was established, and 2 ml. of sterile physiologic saline solution was injected rapidly through the needle to assure its patency. The calculated dose** of contrast medium (70% sodium acetrizoate†) was then injected as rapidly as possible, consuming from 0.5 to 1.5 seconds. A film-changing device‡ was activated when approximately half of the contrast medium had been administered. Since no data were available indicating the optimum time(s) to take radiographs in diro filariasis, a large number of exposures were made. Twelve films were exposed at 0.5-second intervals using 200 Ma. and 0.05-second exposure time for each radiograph. A 10:1 fine-line grid and high-speed intensifying screens were used in each cassette. The film-anode distance was 36 inches.

During and after recovery from anesthesia, the

**The dosage used was 15 ml. for dogs up to 20 lb., 20 ml. for dogs from 20 to 40 lb., and 25 ml. for dogs over 40 lb.

†Urokon is manufactured by the Mallinckrodt Chemical Works, St. Louis, Mo.

‡This device is known as the Sanchez-Perez Universal Automatic Seriograph, Model 110, manufactured by the Automatic Seriographic Corp., College Park, Md.

dogs were observed for possible toxic effects which are well documented in the literature dealing with angiography in man.¹ The only toxic manifestations that occurred in this series were those observed 6 to 10 seconds postinjection when a high concentration of contrast medium in the blood reached the brain. These manifestations were characterized by a period of brief apnea followed by several seconds of hyperpnea. Venous thrombosis along the route of injection could not be seen at necropsy.

Results

The dogs were divided into five groups on the basis of total number of adult *Dirofilariae* harbored (table 1). Pulmonary arteries of a normal dog (fig. 2) were noticeably smaller than those in severely infected dogs (fig. 3, 4, 5). Preoperative angiograms showed prominent streaking and mottling or contrast reticulation in the pulmonary arteries (fig. 3, 4). A postoperative angiogram showed a striking absence of this pattern (fig. 5).

Evaluation of the 12 angiograms in each series indicated that the most marked changes could be seen best in the early ones, because they showed contrast medium flowing through the right side of the heart and pulmonary arteries (fig. 2, 3). Later angiograms showing the contrast medium in the left side of the heart were relatively unrevealing.

Two deaths occurred in this series, but neither could be attributed directly to the angiographic procedure. Dog 153 died on the second postoperative day, of complications resulting from surgical cardiac arrest. Dog 123 died during surgery due to irreversible ventricular fibrillation. No other complications referable to the angiographic procedure occurred in this group of dogs.

Discussion

The pattern of streaking or contrast reticulation in the pulmonary arteries was the most consistent feature of the preoperative radiographs. This was apparently due to presence of adult *Dirofilariae* in these arteries, with resultant interference in the even distribution of contrast medium. The consistent absence of this pattern in postoperative radiographs gives strong

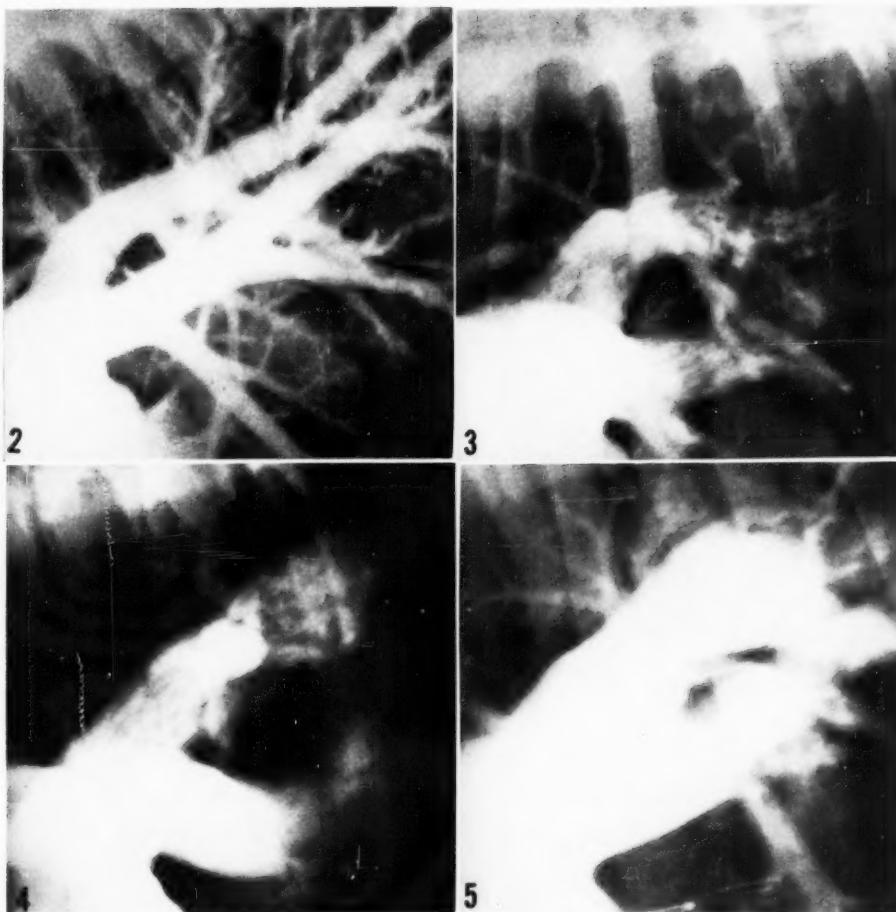


Fig. 2 — Angiocardiograph of an uninfected dog showing normal size of the pulmonary arteries and even distribution of contrast medium in the arteries.

Fig. 3 — Dog 140 — angiocardiograph obtained approximately 1.5 seconds (radiograph 3 of a series of 12) following injection of contrast medium. This dog harbored 28 adult heartworms. Notice dilatation and streaking of contrast medium in the pulmonary arteries.

Fig. 4 — Dog 176 — this is an angiocardiograph (taken 1.5 seconds postinjection) of a dog considered to have heavy heartworm infection. A total of 57 Dirofilaria are present. Streaking and pulmonary artery dilatation are prominent.

Fig. 5 — Dog 176 — this angiocardiograph was taken after surgical removal of 52 heartworms. Although 5 are still present, the filling of the pulmonary arteries is uniform (no streaking). The dilatation of the pulmonary arteries is prominent and an apparent poststenotic dilation may be seen in the left pulmonary artery.

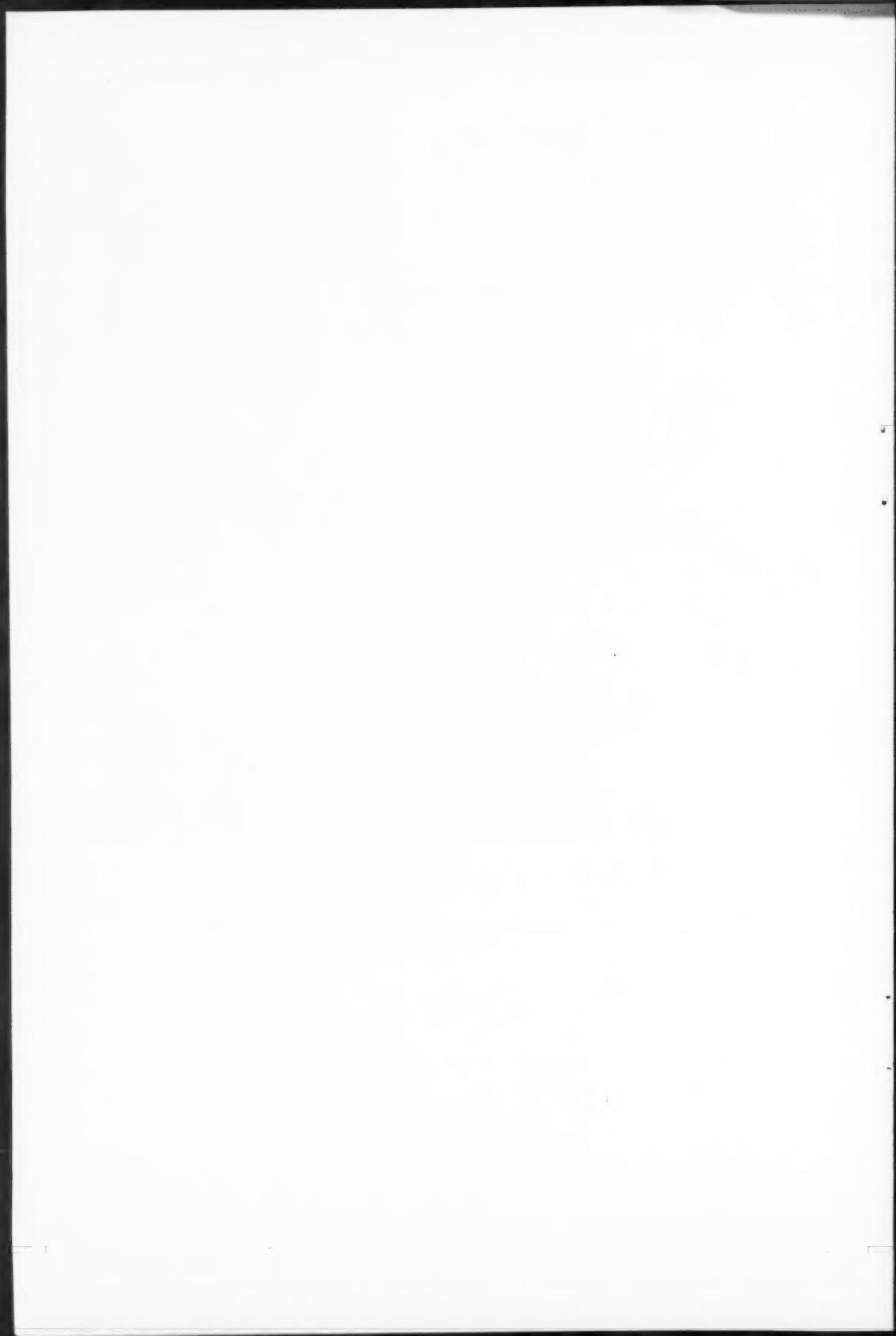


TABLE 1—Summary of Angiocardiographic Data

No. worms recovered							Pathologic changes at necropsy	Significant preoperative findings	Significant postoperative findings
Dog (No.)	Est. age (yr.)	Sur-gery	Nec-rapsy	To-tal	Av. dog				
GROUP 1 (light infection)									
153	5	4	1	5	....	None.	Slight dilatation of left P.A.* but no streaking or mottling present.	None. Dog died on second postoperative day.	
185	10	4	0	4	....	Slight pulmonary endarteritis.	Heavy vascular shadows in lung fields. Slight dilatation of left P.A. but no streaking.	Essentially those of preoperative series, but without any striking vascular markings in lungs.	
....	....	....	....	....	4.5				
GROUP 2 (light to moderate infection)									
129	10	11	2	13	....	Slight pulmonary endarteritis.	Rapid filling of P.A. with faint mottling in left P.A. Early filling of left side of heart.	Same as preoperative radiographs.	
149	4	9	2	11	....	Moderate pulmonary endarteritis.	Heavy vascular markings in lung fields. P.A. of normal size with no streaking present.	Vascular markings still prominent. P.A. well filled.	
183	2	11	2	13	....	Slight pulmonary endarteritis.	Slight streaking present, especially in right P.A., less so in left P.A. Slight dilatation observed in both branches.	No streaking observed. Both P.A. dilated greater than on preoperative radiographs.	
....	....	....	....	....	12.3				
GROUP 3 (moderate infection)									
123	7	20	3	23	....	None.	Slight dilatation of both P.A. and slight streaking in right P.A.	None. Dog died during surgery.	
140	10	28	0	28	....	Moderate pulmonary endarteritis.	Dilatation of both P.A. with very prominent streaking in both P.A.	Uniform filling of both P.A. with no streaking present.	
142	5	19	0	19	....	None.	Dilatation of both P.A. with prominent streaking present in both P.A.	Uniform filling of both P.A. with no streaking present.	
165	4	24	0	24	....	Slight pulmonary endarteritis.	Rapid filling of both P.A. with very slight streaking in left P.A.	Good filling of both P.A. with dilatation of left P.A. greater than preoperative.	
....	....	....	....	....	23.5				
GROUP 4 (moderate to heavy infection)									
138	10	37	9	46	....	Moderate pulmonary endarteritis.	P.A. slightly dilated but both are prominently streaked.	Early uniform filling of both P.A.	
174	4	40	0	40	....	Moderate pulmonary endarteritis.	Dilated right ventricle and P.A. with pronounced streaking in both P.A., especially the right. Both quite tortuous.	Good filling of both P.A. but dilatations still present.	
....	....	....	....	....	43.0				
GROUP 5 (heavy infection)									
148	4	54	4	58	....	None.	Very slight amount of streaking in distal portion of left P.A. Both P.A. appear slightly dilated.	Rapid filling of right P.A. and somewhat delayed filling of left P.A.	
167	2	66	4	70	....	Moderate pulmonary endarteritis.	Pronounced streaking in both P.A.; dilatation of both P.A., especially the left.	Good filling of both P.A. Dilatation not as great as on preoperative radiographs.	
176	10	52	5	57	....	Moderate pulmonary endarteritis.	Prominent streaking and dilatation of both P.A. Irregular right ventricular filling with dilatation.	Uniform filling of right ventricle and both P.A.; dilatations of P.A. are still quite prominent.	
....	....	....	....	....	61.6				

*P.A. denotes pulmonary artery.

support to this conclusion. Absence of streaking also precludes the pulmonary endarteritis evident in some of these animals at necropsy as a possible cause of this finding. A broader study involving a larger number of animals and a wider range of techniques will be necessary to definitely establish this observation, since a group of this size does not lend itself to statistical evaluation.

The streaking pattern was observed in 11 of the 14 (79%) dogs in this study. Both dogs in group 1 and 1 in group 2 showed no streaking in the pre- or post-operative radiographs. The streaking was slight but still recognizable in 5 of the 14 dogs (35%), and it was prominent in 6 others (44%). Two of 3 dogs in group 2, 2 of 4 dogs in group 3, and 1 of 3 dogs in group 5 had only slight streaking in the pulmonary arteries. Half of group 3, all of group 4, and two thirds of group 5 had prominent streaking patterns in the pulmonary arteries. Streaking was not seen on any postoperative radiographs.

Dilatation of the pulmonary arteries was easily demonstrated with the aid of vascular contrast medium and was considered of importance in this group (table 1).

One disadvantage of this procedure was observed. In radiographs taken in the lateral recumbent position with injection carried out through the cephalic or jugular vein, the conus arteriosus is overshadowed by the right ventricle and venous inflow tracts. Direct injection of the right ventricle by means of a cardiac catheter or injection into a hindlimb vein may overcome this difficulty. Serial radiographs make possible a semicontinuous record of the progression of contrast medium. If accurately timed, single radiographs as early as 1.0 to 1.5 sec. postinjection should demonstrate this pattern when a film-changing device is not available (a private veterinary practice could not easily justify its cost).

Toxic manifestations of the contrast medium were of no consequence in this series. Venous thrombosis was not seen.

Summary

Fourteen dogs infected with *Dirofilaria immitis* were subjected to intravenous angiography before and after surgi-

cal removal of the worms via pulmonary arteriotomy. In order to follow the contrast medium throughout most of its course through the heart and lungs, a rapid film-changing device was utilized and 12 exposures made in each series.

Streaking, mottling, or reticulation of contrast medium as it flowed through the pulmonary arteries was seen in preoperative angiograms, but this pattern was not evident in postoperative angiograms. Dilatation of one or both pulmonary arteries was also a prominent feature and it persisted after surgery.

Angiocardiography aided diagnosis of canine dirofilariasis in the 14 dogs cited and may be a valuable adjunct to evaluation of dogs being considered for pulmonary arteriotomy removal of heartworms.

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Abortions in Heifers Fed Hexoestrol-Containing Silage

Abortions in 7 heifers were due to hexoestrol (synthetic estrogen) with which their silage ration had become contaminated. This contamination resulted from sealing the silo pit with manure from hexoestrol-fed bullocks. Hexoestrol persisted in the manure for 9 to 12 months.—*Vet. Rec.* 71, (1959): 924.

A Technique of

Canine Angiocardiography

*with the Interpretation of a Normal
Left Lateral Angiocardiogram*

Robert J. TASHJIAN, A.B., V.M.D.
Nicolo M. ALBANESE, M.D.

INTRAVENOUS angiography, a specialty which has been developing in medicine for the past 20 years,⁹ is now beginning to be employed in diagnosis and interpretation of both congenital and acquired cardiac defects in animals.^{5,10} A procedure developed for dogs, during the course of study of naturally occurring canine cardiovascular disease, is described here.

The method consists of insertion of a catheter aseptically through the right jugular vein into the anterior vena cava adjacent to the right atrium, followed by rapid injection of a bolus of contrast medium. Rapid sequence radiographs then chart its course through the heart and great vessels, thereby delineating anatomical abnormalities or changes in the rate of blood flow.

The method consists of anesthetizing the animal, with a short-acting anesthetic, in order to make an incision into the right jugular vein and to insert the catheter into the anterior vena cava adjacent to the right atrium. This catheter is connected with as short a length of plastic tubing as possible to an automatic syringe* used for the injection of the contrast medium. By this method, a compact bolus of contrast medium is injected rapidly with the least amount of travel time and lengthening of

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The authors thank the Department of Surgery, St. Clare's Hospital and St. Clare's Institute of Medical Research, New York, N.Y.

*Casten automatic syringe with two-coil spring apparatus generating from 60 to 150 lb. pressure with automatic release, obtainable at the Whyte Manufacturing Co., New York, N.Y.

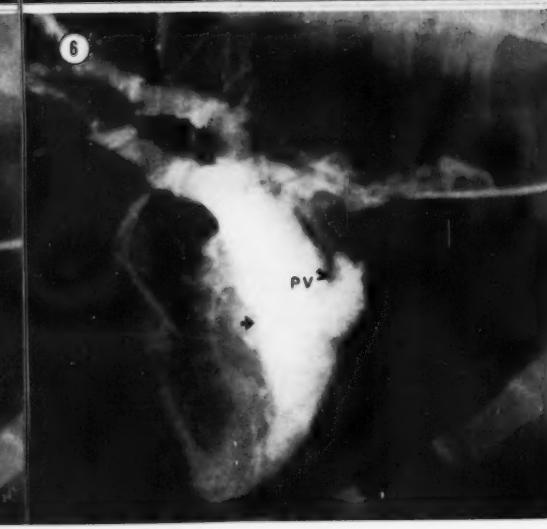
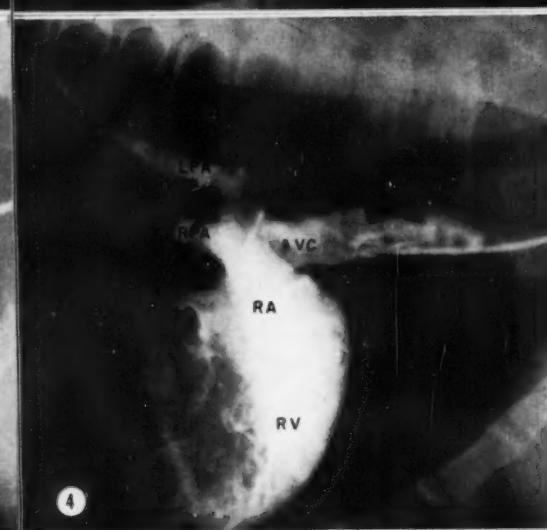
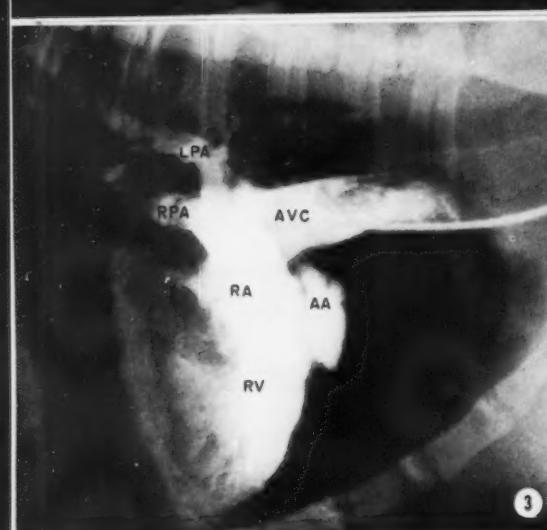
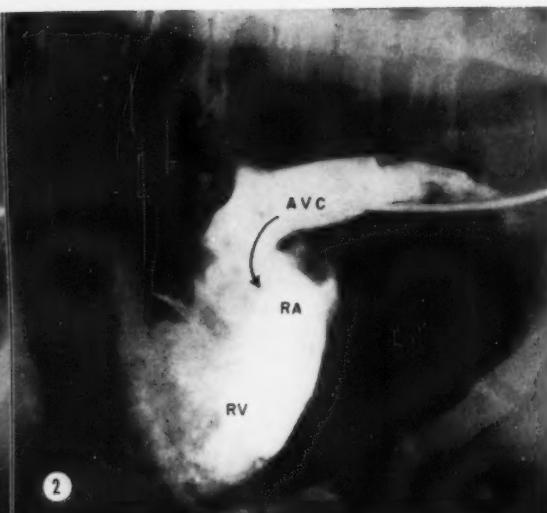
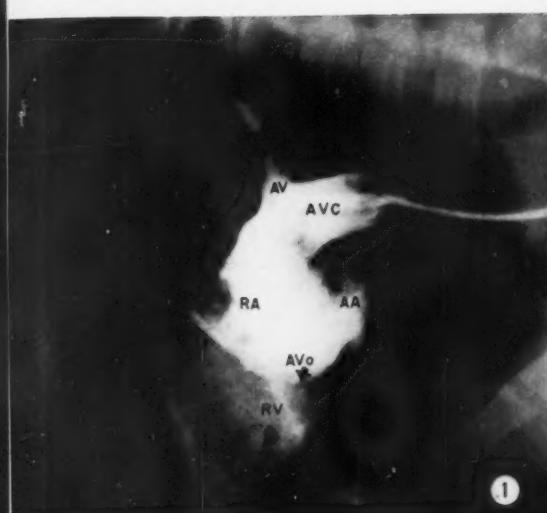
the bolus before it reaches the right atrium.

After the catheter is inserted, the animal is placed in the left lateral position which has proved to be the most useful for convenience and ease of interpretation.

To permit short exposures and to eliminate blurring as the contrast medium travels through the chambers of the heart, radiographs are taken at 1/1,000 of a second at 1,000 milliamperes (ma) and at 1/200 of a second at 1,000 ma. The kilovolt peak (kv. p.) is varied in order to obtain the best radiographic detail of each individual animal and, in most cases, ranges from 60 to 125 kvp depending upon the size of the animal. The former settings give sharper definition of valves and structures within the heart.¹¹

The flow of contrast medium from right atrium through the right ventricle, pulmonary arterial supply, pulmonary venous return, left atrium, left ventricle, and aorta requires approximately 5 seconds in a normal dog. Our usual technique consists of automatic injection of contrast medium and then making 3 radiographs per second for 5 seconds followed by 2 radiographs per second for 2½ seconds, totaling 20 radiographs in 7½ seconds. The added 2½ seconds of radiographs compensates for possible delay.

However, in pathologic conditions, especially in acquired heart disease where blood flow is delayed, it becomes necessary to alter this technique for each particular case. In most cases of acquired heart disease, such as mitral stenosis and mitral insufficiency, the following technique is used: automatic injection of contrast



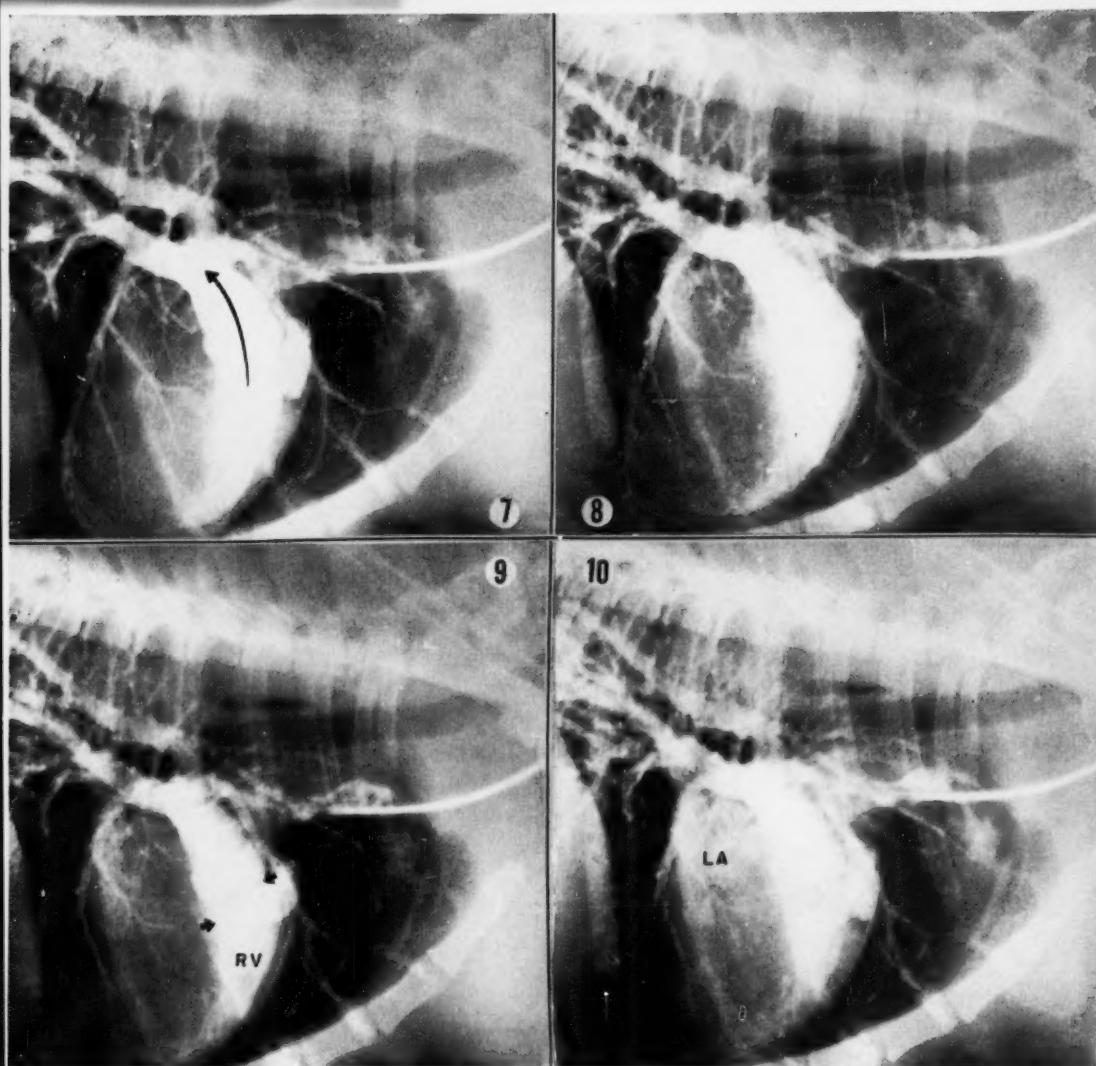


Fig. 1—After administration of medium: at 1/3 sec. — filling of anterior vena cava (AVC) and right atrium (RA); azygous vein (AV) reflux; right auricular appendage (AA) partially visualized; visualization of right atrioventricular (AVa, arrow) valve; slight opacification of right ventricle (RV).

Fig. 2—At 2/3 sec. — continued filling into AVC; further filling of RA and RV; diastole of RV; decreased opacity of right auricular appendage in systole.

Fig. 3—At 1 sec. — RV systole and filling of right auricular appendage; beginning opacification of left pulmonary artery (LPA) and right pulmonary artery (RPA).

Fig. 4—At 1 1/3 sec. — systole of RA; diastole of RV; further filling of pulmonary tree.

Fig. 5—At 1 2/3 sec. — complete systole of RV with pulmonary valves (PV, arrow) visualized.

Fig. 6—At 2 sec. — systole contracture slightly less than in figure 5.

Fig. 7—2 1/3 sec. — outflow tract from right heart indicated by arrow.

Fig. 8—At 2 2/3 sec. — diastole of RV; pulmonary valves and infundibulum visualized; opacification into finer branches of pulmonary tree.

Fig. 9—At 3 sec. — beginning systole of RV; visualization of right auricular appendage; wide pulmonic ring visualized.

Fig. 10—At 3 1/3 sec. — systole of RV; beginning opacification of left atrium (LA).

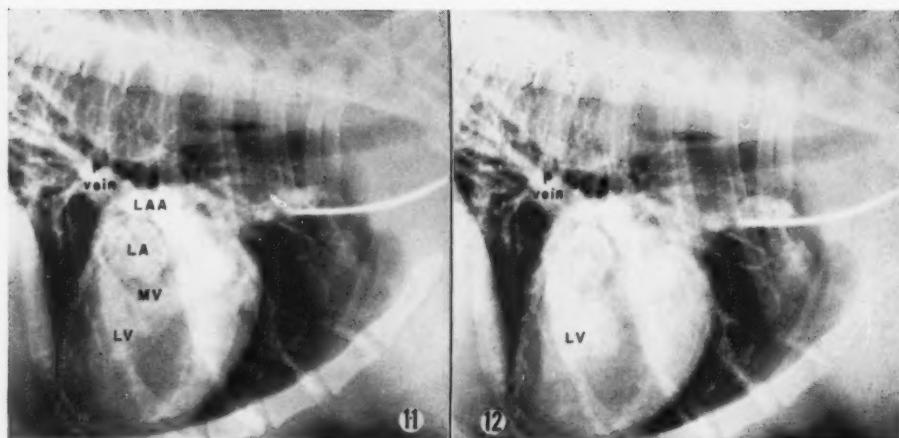


Fig. 11—At 3 2/3 sec. — decreased opacity in right side of heart; considerable distribution of contrast medium in venous pulmonary bed; visualization of pulmonary vein return; beginning visualization of left auricular appendage (LAA), mitral valve (MV), and left ventricle (LV).

Fig. 12—At 4 sec. — note pulmonary vein opacity does not reach the intensity of the pulmonary arterial supply; ventral motion of mitral valve going into diastole.

medium, 2-second pause after injection, 3 radiographs per second for 3 seconds, 8-second pause, 3 radiographs per second for 7 seconds. This yields a total of 30 radiographs in 20 seconds.

With this technique, the right side of the heart is opacified during the 3 radiographs per second in 3 seconds, and the 3 radiographs per second for 7 seconds will usually show some opacity of the right side of the heart, as well as complete

visualization of the left side of the heart and aorta. The maximum number of radiographs should be taken during the period when the contrast medium is traveling through the area of cardiac defect. This technique gives the most complete picture of valvular, structural, and filling defects related to the cardiac lesion.

Various contrast mediums can be used for angiography. It is important that dosage is adjusted according to rate

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Fig. 13—At 4 1/3 sec. — LA in diastole; systole of LV; slight opacification of LV, aortic valve (AV), and root of aorta; jet streams present in LV outflow tract.

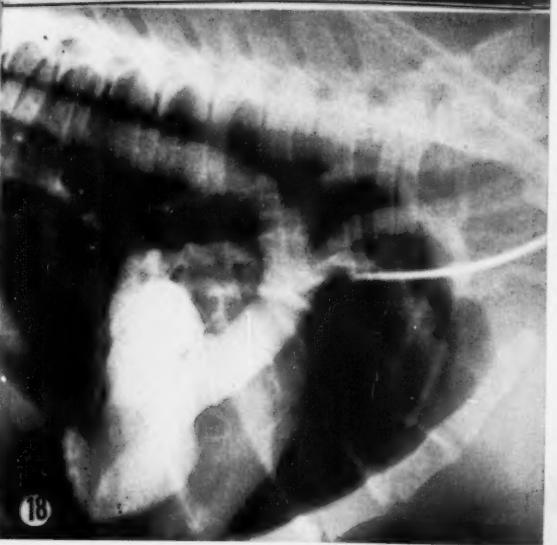
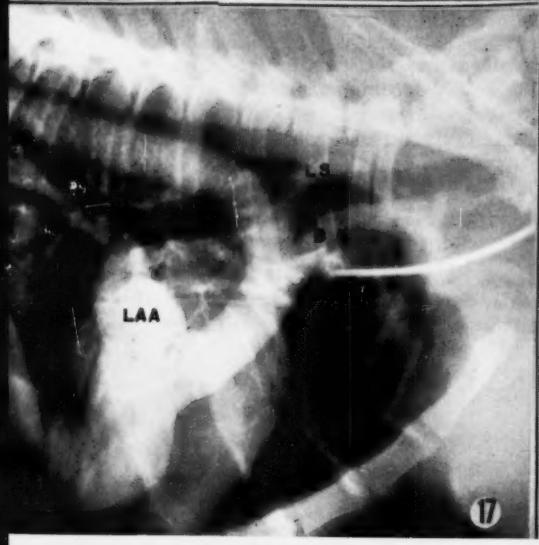
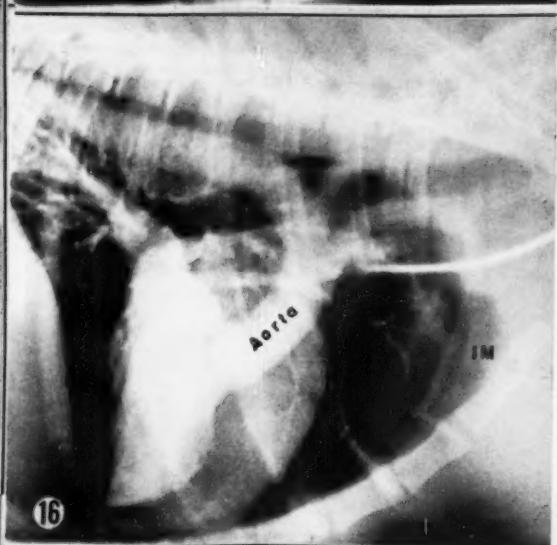
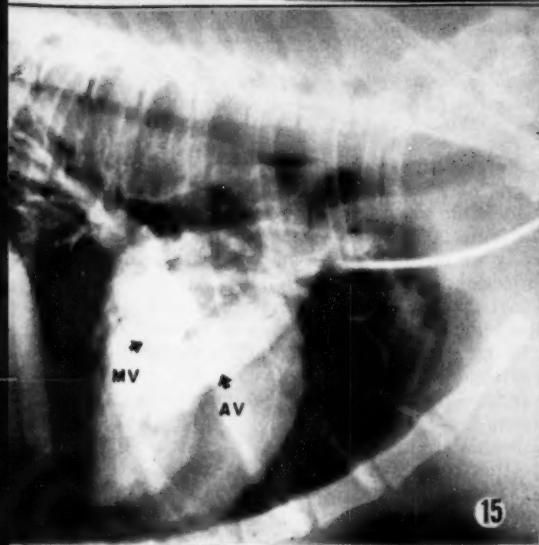
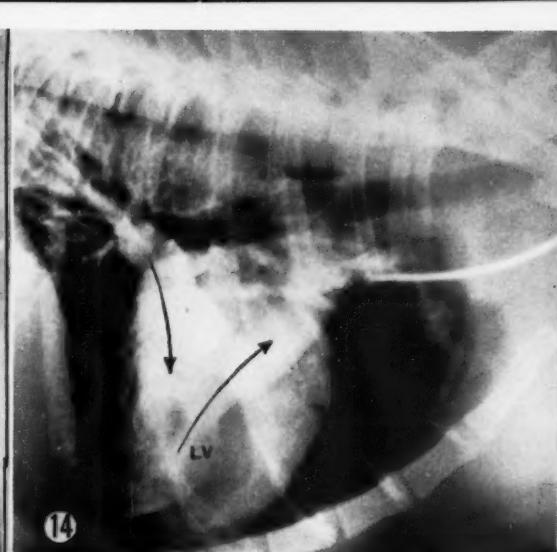
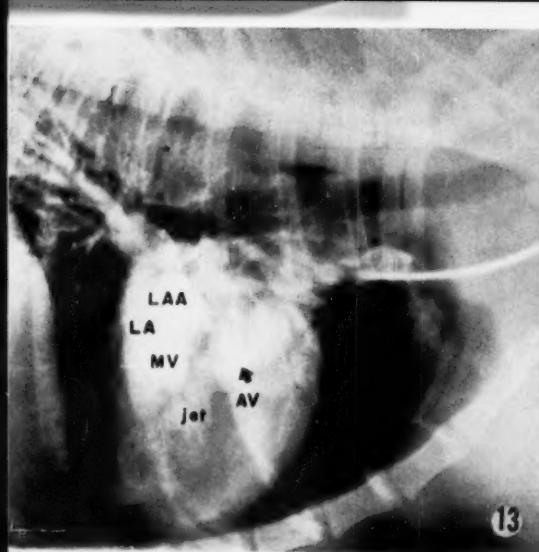
Fig. 14—At 4 2/3 sec. — inflow and outflow tracts of left side of heart indicated; partial systole of left ventricle.

Fig. 15—At 5 sec. — good visualization of LV outflow tract; pulmonary vein return still present.

Fig. 16—At 5 1/2 sec. — all structures of left side of heart visualized.

Fig. 17—At 6 sec. — concentration of opacifying medium in left auricular appendage; brachiocephalic (B) and left subclavian (LS) arteries well visualized.

Fig. 18—At 6 1/2 sec. — partial systole of LV; good opacification of aorta and its thoracic tributaries.



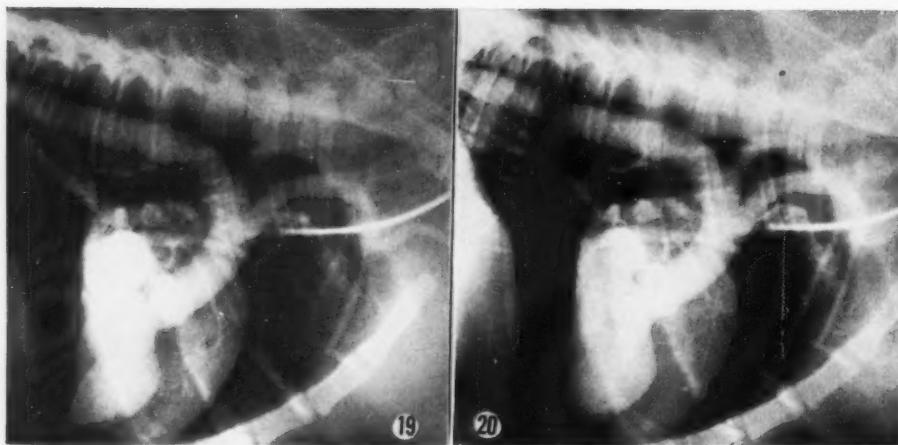
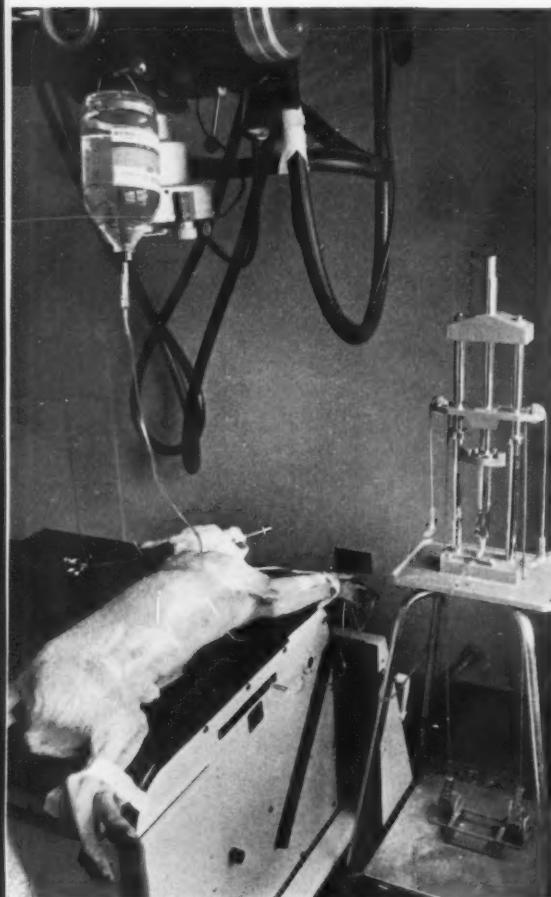


Fig. 19—At 7 sec. — systole of LA; diastole of LV; closure of aortic valve.

Fig. 20—At 7 1/2 sec. — some PV return; LAA quite apparent; systole of LA; diastole of LV; closure of aortic valve.



and method of injection so that both the right and left sides of the heart will not be visualized at the same time. Diatrizoate sodium (90%) at the rate of 0.5 cc./lb. of body weight or less, by means of automatic injection, is frequently used.

When the dog is properly positioned, the machine is set for the required number of radiographs per second. The automatic syringe is then released, and the x-ray machine is started nearly simultaneously from the control booth. Isotonic fluids are administered intravenously after the injection to hasten the excretion of the contrast medium.

Normal left lateral angiograms of a 40-lb. Boxer are shown following administration of 20 cc. of diatrizoate sodium (90%) automatically through a catheter inserted into the anterior vena cava (fig. 1-20). The technique consisted of 1/200 of

Fig. 21—Showing anesthetized dog in position on table for angiographic study. The two handles are pulled down and inserted into the slots at the base of the assembly to exert pressure on the syringe. The clip just distal to the tip of the syringe compressing the tubing is released from the control booth.

—A Scope Weekly photo, courtesy the Upjohn Co., Kalamazoo, Mich.

a second, 1,000 ma, 78 kv.p.; 3 radiographs per second for 5 seconds, and then 2 radiographs per second for 2½ seconds. Necropsy after the series revealed no pathologic cardiac conditions.

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Effect of "Supercarbia" in Anesthetized Dogs

Inhalation of more than 50 per cent of carbon dioxide causes respiratory failure in dogs. In order to study this effect, the concentration of the gas was raised and inhaled by dogs as a mixture of carbon dioxide, oxygen, and anesthetic. Respiratory arrest occurred upon inhalation of 23 to 55 per cent of carbon dioxide, depending upon the anesthetic. The concentration of carbon dioxide, increased to 60 to 80 per cent, did not cause serious cardiovascular effects. Upon discontinuing the anesthetic (since at such high concentrations carbon dioxide itself acts as an anesthetic), the dogs resumed regular, though slow respiration.

Dogs were kept in this state of "supercarbia" for 1 hour or more without any significant change in blood pressure or electrocardiogram.

This finding suggests that prolonged severe carbon dioxide inhalation is not necessarily harmful, if the effects of the anesthetic and the convulsions can be eliminated. The lethal limit is an excess of 80 per cent.—*Nature*, 184, (1959): 1071.

*Efficacy of Cyanacethydrazide
Against *Metastrongylus* spp.,*

Lungworms in Swine

H. G. SEN, M.S.
G. W. KELLEY, PH.D.
L. S. OLSEN, PH.D.

IN 1957, it was found that cyanacethydrazide* effectively eliminated *Dictyocaulus viviparus* from cattle, *Dictyocaulus filaria* from sheep and goats, and *Metastrongylus* spp. from swine.^{2,4} Also, in 1958, a field evaluation showed that the drug eliminated *Metastrongylus* spp. in swine.¹ However, these latter conclusions were based entirely on clinical recovery from the signs of respiratory disease and no final necropsies or egg counts were made. In 1959, it was reported that the drug was somewhat effective against low-level infections of *D. viviparus* in cattle and generally ineffective against heavy infections.²

The following is a report of 4 tests of the effectiveness of cyanacethydrazide for removing *Metastrongylus apri* and *Metastrongylus pudendotectus* from the lungs of swine.

Methods and Materials

Mixed cultures of third-stage larvae of *M. apri* and *M. pudendotectus* were fed to pigs to establish lungworm infections. Fecal egg counts were made to verify the presence and determine the intensity of lungworm infections.⁵

The authors are members of the Department of Veterinary Science, University of Nebraska at Lincoln. Drs. Kelley and Olsen are academic staff members; Mr. Sen is a graduate research assistant in that department.

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*Cyanacethydrazide is marketed as Dictycide in the United States by Fort Dodge Laboratories, Fort Dodge, Iowa.

Trial 1.—Five pigs weighing 210, 200, 198, 196, and 195 lb., respectively, were inoculated with 600 infective lungworm larvae by stomach tube. Egg counts made from fecal specimens obtained 4 weeks after ingestion of the larvae indicated that all 5 pigs had become infected. After another 2 weeks (6 weeks following inoculation), cyanacethydrazide was injected subcutaneously into 4 pigs for 3 consecutive days at 16 mg./kg. body weight. Three treated pigs and the control pig were killed and their lungs were examined for worms 5 days following the last treatment. Lungs of the fourth treated pig were examined 27 days following treatment.

Results.—The EPG (eggs per Gm. of feces) of the treated pigs were reduced from a pretreatment average of 45.0 EPG to 0.2 EPG post-treatment. Five days following treatment, many immature and a few adult worms were found in the lungs of the treated pigs. Many immature and a few adult worms were likewise found in the treated pig which was examined 27 days post-treatment. Egg counts of the control pig increased from 96 EPG on the day the other pigs were treated to 124 EPG 12 days later. Numerous adult worms were found in the lungs of this control pig when it was examined simultaneously with the first 3 principals.

Trial 2.—Two principal pigs and 1 control pig which had had patent lungworm infections for 184 days were used. Cyanacethydrazide was given to the 2 principals as described in trial 1. All pigs were killed and examined 7 days after treatment.

Results.—Parasitism in the treated animals was almost identical with that in the control pig. Egg counts of both the treated

pigs and the control diminished during the trial but numerous adult *Metastrongylus* worms were present in all 3 pigs at necropsy.

Trial 3.—Two principal pigs (47- and 51-lb.) and 1 control pig (58-lb.) were used. Each pig was inoculated with a dose of 3,570 infective lungworm larvae. Treatment was administered as described in the previous 2 trials and was begun 28 days following inoculation. No necropsies were performed in the experiment, the efficacy of the drug being determined on the basis of reduction of numbers of eggs in the feces.

Results.—No reduction in the EPG count was noted in the principals.

Trial 4.—In this trial, the efficacy of cyanacethydrazide against *Metastrongylus* spp. at varying stages of development was checked. Seven pigs, 3 weeks old, were each inoculated with about 2,300 lungworm larvae. One pig was selected as a control and the remaining 6 were divided into 3 principal groups of 2 pigs each. The 3 groups of principals were treated, beginning 7, 21, and 42 days, respectively, after inoculation with 3 subcutaneous injections of cyanacethydrazide on 3 successive days. The dosage level was the same as that in experiment 1. Efficacy of the treatment was determined on the basis of reduction of EPG. The 2 pigs treated 7 days after inoculation and 1 of the pigs treated 21 days after inoculation were killed and examined 126 days after inoculation.

Results.—The principals developed nearly equal egg counts regardless of the developmental stage of the lungworms when treated. Egg counts diminished more rapidly in all 3 treated groups than in the control pig (table 1). Adult worms were present in the lungs of the 3 treated pigs which were examined 126 days postinoculation (150, 35, and 71 respectively), although their feces had been free of eggs for some time. Indications seem to be that cyanacethydrazide in this trial impaired egg production but did not expel all the worms.

Discussion

In the trials, cyanacethydrazide exhibited erratic anthelmintic activity against lungworm infections. In trial 1,

TABLE 1 — The Number of *Metastrongylus* Eggs Per Gram of Feces (EPG) from 3 Groups of Lungworm-Infected Pigs Which Had Been Inoculated with Cyanacethydrazide when the Worms Were 7, 21, or 42 Days of Age

Age of worms when treated	Days postinoculation					
	42	46	50	53	55	60
7 days	329*	62	63	36	19	13
21 days	615*	115	5	3	3	5
42 days	629*	106	15	16	19	14
Control	448**	70	342	162	352	162
						102

*Mean eggs per gram of feces from 2 pigs. **Mean eggs per gram of feces from 1 pig.

it appeared that the drug acted against swine lungworms (negative egg counts 5 days following treatment), but adult and immature worms were recovered from the bronchioles of the lungs of treated pigs at necropsy. In trial 2, the results obtained indicated that the drug failed to exert any anthelmintic activity on the worms even in repeated doses. This observation is contrary to observations of other investigators who reported that the drug is 67 to 100 per cent effective against lungworms living in the air passages in cattle, sheep, goats, and swine.^{1,3,4}

The number of larvae used for establishing artificial infections with *M. apri* in swine in 1957 was not clearly indicated.^{3,4} It seems likely that a moderate infection was established since only 242 to 471 worms were recovered from control pigs at necropsy. Possibly trial 1, reported here, involved a lower level of infection than our subsequent experiments, and for this reason cyanacethydrazide may have been more effective in this trial than in the others. Similar results were reported in 1959 when it was observed that 9 of 69 lightly parasitized cattle lost their lungworms as a result of treatment with cyanacethydrazide, whereas heavier infections remained unaffected after treatment.² A 1958 evaluation of the therapeutic activity of cyanacethydrazide in swine, based on the apparent improvement of clinical symptoms, did not involve any postmortem examinations of the lungs.¹

There is evidence from our trials that cyanacethydrazide affects the egg-producing mechanism of lungworms, since the egg counts of injected pigs were reduced, but worms were still present at necropsy. This characteristic has also been observed by

others who noted that the larvae production of lungworm-infected cattle diminished following treatment.² Our observations suggest that cyanacethydrazide does not have significant anthelmintic activity in swine experimentally infected with *Metastrongylus* spp. It may possess some activity in light infections.

Summary

Cyanacethydrazide inoculated subcutaneously in 3 successive daily doses (16 mg./kg. body weight) had only slight efficacy against *Metastrongylus* spp. in swine. In one trial, the treatment apparently dislodged many of the adult lungworms. No efficacy was evidenced in 2 subsequent trials. In another trial, pigs were treated

7, 21, and 42 days postinoculation. Egg counts of these pigs equaled the egg counts of control pigs, but diminished more rapidly.

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Warfarin Poisoning of Newly Weaned Pigs

Massive warfarin poisoning in newly weaned Yorkshire pigs weighing 8 to 10 lb. was characterized by limping, muscular and articular swellings, nosebleeds, dark blood-stained stools, and fever.

Lesions were characterized by hemorrhage in all body cavities, organs, muscles, and articulations, by hypocoagulability of the blood, and by general toxicosis. Of a total of 700 pigs, 195 were affected, and over 50 per cent of these died.

A combination of vitamin K and homologous blood was administered intraperitoneally. Treatment was repeated in doses of 20 to 50 ml. Live or dead rats were considered to be the main sources of warfarin.—*Rec. med. vét.*, Paris, 135, (1959): 822.

Fewer Spring Pigs Expected in 1960

Farmers reported to the Agricultural Marketing Service of the U.S.D.A. in early December that they expected to have 12 per cent fewer sows farrow spring pigs than last year. Litters of average size, adjusted for trend, would result in a spring crop of 52 million head, 11 per cent fewer than last year which is about the same as in 1958.—*Agrie. Outlook Digest*, Jan., 1960.

A Case Report —

Lymphoblastic Lymphoma

in a Bovine Fetus

Basil C. HATZIOLOS, D.V.M.

Bovine malignant tumors of the lymphoma group are most frequently found in cattle between 7 and 8 years of age.^{2,7,10,11,14,21,25,32,34,38,44,46} Dairy cows, especially shortly after parturition, appear to be most often affected.^{9,20,24} This postparturient tendency seems to exist also in human beings, when an acute exacerbation of the leukemic process frequently occurs following childbirth.³⁵

In contrast, malignant lymphomas are relatively rare in young calves and even more rare in sucklings. A review of pertinent veterinary literature published to date revealed a total of only 12 cases of leukemia in calves 15 days to 6 months old.^{12,16,23,28,37,41,42,49}

Two cases of lymphoid leukemia in calves 8 to 14 days old have been reported.⁴⁷ Diagnosis of leukemia was made either on the basis of blood examination or gross pathologic changes. In 1 of these cases, pathogenic bacteria were recovered from culturing the lymph nodes of a calf with leukemia.³³

Only 2 cases of malignant lymphoma have been recorded in bovine fetuses—1 at 113 days²⁶ and another at 210 days⁴³ of intrauterine life. In the first case, lesions

were limited to a white spot 2.0 cm. in diameter and 0.1 cm. thick in the subcutis of the flank. However, confirmation of leukemia by histologic examination was not mentioned. In the second case, confirmation of the leukemic condition by histologic examination was merely referred to without details.

Since all cases of leukemia in calves and fetuses reported, with the possible exception of one,⁴⁷ concern offspring of dams with leukemia, transmissibility through the placenta walls^{17,23,26,36,37,42,43,47,49} has been assumed.

The purpose of this paper is to report a case of metastasized lymphoblastic lymphoma in a stillborn bovine fetus from a dam free of leukemia. It is hoped that this report will contribute to a better understanding of the etiology of this type of cancer.

Case Report

History.—The fetus was expelled dead during the eighth month of pregnancy of a 2-year-old primiparous Shorthorn heifer. Necropsy was performed. The head, parts of lung, liver, stomach, and intestine, the spleen, and pieces of skin representative of lesions observed were sent to the laboratory for bacteriologic and histologic examinations. The physical condition of the dam during parturition and thereafter appeared to be satisfactory. Uterine palpation and blood examination performed 15 days after parturition did not reveal any abnormalities. Brucellosis and leptospirosis tests yielded negative results. The dam was rebred to the same sire; she conceived 6

From the Liv Stock Sanitary Service Laboratory, University of Maryland, College Park.

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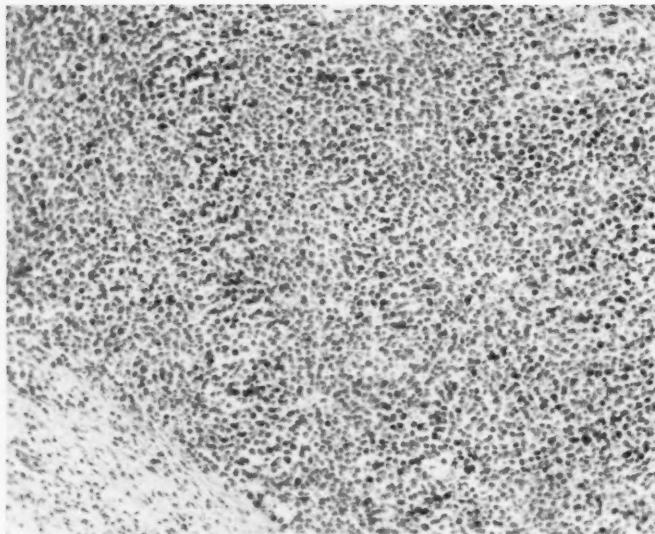


Fig. 1—Photomicrograph showing a malignant lymphoblastoma in fetal bovine lung. Large metastatic nodule shows numerous hyperchromatic cells and scattered mitotic figures. Separation of nodules from the parenchyma by thick capsule may be seen in lower left corner. H & E stain; $\times 150$.

months following the first parturition and gave birth to a normal bull calf. On last inspection (Sept., 1959), 7 months after parturition, both the dam and the calf were apparently in good health.

Postmortem Reports.—The organs of the fetus showed signs of maceration, suggesting that it had been dead for some time before it was expelled. The cranial bones

had not completely fused and an encephalocele had formed. Numerous glistening nodules were dispersed on the surface and in the mass of the lung and liver parenchyma and skin. The gastrointestinal tract and the spleen were involved, but to a lesser extent. In the stomach and intestines, the nodules were smaller. In the intestines, their distribution appeared to coincide

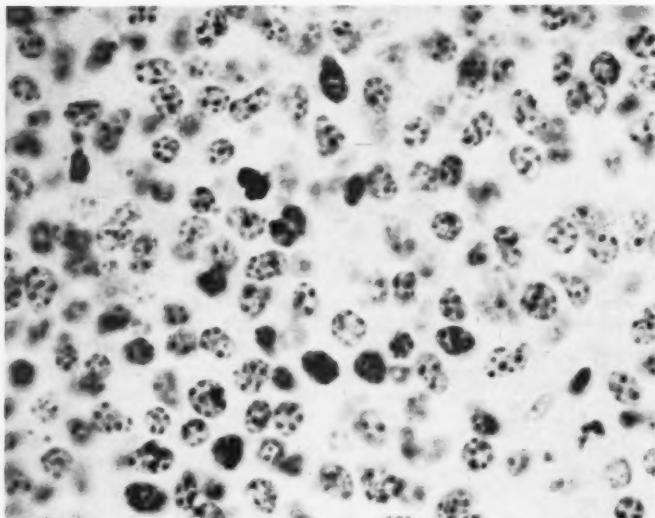


Fig. 2—Higher magnification of same section shown in figure 1 shows individually discrete tumor cells of fetal bovine lung with anaplastic characteristics and several mitotic figures. Giemsa's stain; $\times 1,000$.

with that of Peyer's patches. The spleen showed only 2 nodules, located superficially. Generally, the tumor-like nodules had a smooth grayish white color and appeared to be soft, as if devoid of a dense architecture. They were loosely attached and could be easily separated from the surrounding tissue. They ranged from 0.8 to 1.0 cm. in diameter, were well-circumscribed, and formed button-like elevations on the surface of the organs.

The cutaneous nodules were small and closely demarcated from the surrounding tissue. They had a diameter of approximately 0.5 cm. and were elevated about 2 to 3 mm. above the surface of the skin. Here, the continuity of the epidermis appeared to be damaged.

The brain showed signs of postmortem changes. Nodules of the same morphologic character as those mentioned were merged and dispersed throughout the encephalon. They sometimes reached a diameter of 2 cm. This organ was second only to the lung in extent of involvement.

Impression smears of the neoplastic tissue stained with Giemsa's stain revealed large basophilic cellular elements of the lymphoid type, but not clearly differentiated. Metachromatic granules were observed in a few cells. Also, scattered neutrophils were found in smears prepared

from the lung, liver, and intestines. A presumptive diagnosis of fungi infection had initially been made; however, cultures for bacteria and fungi proved to be sterile.

Microscopic Examination.—The nodules were composed of large hyperchromatic cells which appeared to be anaplastic lymphoid elements more or less thickly embedded in a delicate, somewhat edematous, stroma. The cells had large oval or round nuclei with rich chromatin network forming numerous basophilic coarse nuclear bodies and, occasionally, a clearly demarcated nucleolus. In many cells, those bodies had a peripheral arrangement and adhered to the nuclear membrane, which was usually well-preserved and sharply-defined. On many occasions, the nucleus was bilobated or multilobated. Mitotic figures were often seen (fig. 2).

The cytoplasm was usually scanty, ill-defined, and almost indistinct from the stroma. Occasionally, however, the outlines of the cells were irregularly shaped, and a slightly basophilic rim of cytoplasm partially overlapped the nucleus. Fine fibrils in the form of a delicate interlacing network were found between the tumorous cells in certain areas sparsely settled with cellular elements.

The vascular bed was well-developed and appeared to encircle small masses of cells

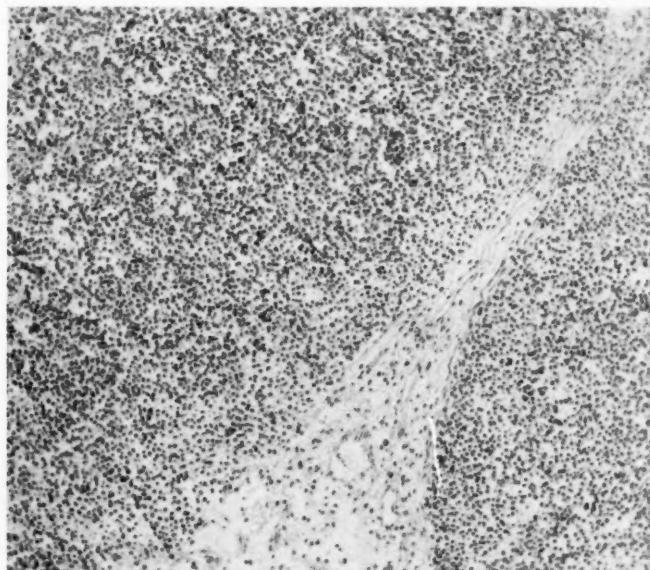


Fig. 3—Confluent metastatic nodules in the brain of the bovine fetus, showing similar architecture as the lung.
H & E stain; $\times 120$.

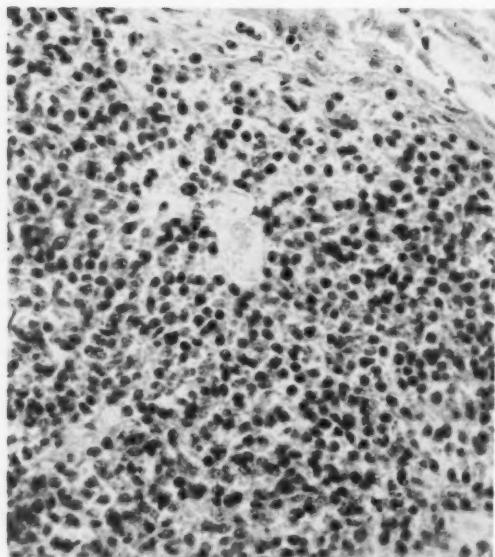


Fig. 4—Small nodule in the liver compresses hepatic cords in the surrounding parenchyma. H & E stain; $\times 350$.

and to divide the tumorous masses into smaller nodules by means of thin reticular bands, which extended from the vascular walls. The capillary lumina contained scanty granular eosinophilic material,

probably the result of advanced autolysis. The pattern of population and orientation of the cells on the stroma appeared to be similar to that of a lymphoid nodule, although in certain places shallow rosettes of cells arranged in one layer were observed around the capillaries.

At the periphery, the nodules tended to be encapsulated; they compressed the surrounding tissue. However, invasion of the capsule and infiltration of tumorous cells in the adjacent parenchyma were observed on several occasions.

In the lung, the nodules were less thickly settled by cells and in many instances were surrounded by a large band of connective tissue, probably formed by proliferation of the interlobular connective tissue (fig. 1). However, in other places the well-defined nodules were separated from the pulmonary parenchyma by a thin capsule which was ruptured and permitted infiltration of tumorous cells into the parenchyma.

In the brain, the nodules were merged (fig. 3). They often exhibited large scattered, necrotic areas containing cellular debris and eosinophilic material. These nodules were not infiltrated by inflammatory cells. Mitotic figures were numerous. On many occasions, chromatin bodies, similar to those noted in the nuclei, were observed free in the stroma, as if the nuclear membrane was broken or had disappeared.



Fig. 5—Nodule in skin shows infiltrating cells in the subcutis; young follicles appear in the upper right. Giemsa's stain; $\times 65$.

by autolysis, and the chromatin bodies were dispersed throughout the area. Here again, the tumorous cells were not concentrated around the large blood vessels. Bands of connective tissue extending from their walls contributed to the formation of delicate septa. Sometimes extensions from a thin capsule divided the tumorous mass into smaller nodules.

In the liver, the round cells were predominant and no necrotic areas were observed. The nodules were smaller but more compact and solid than those in the lung. They compressed the adjacent parenchyma causing atrophy of the hepatic cells. A thin and delicate capsule separated the nodules from the parenchyma (fig. 4).

In the skin, the nodules had thickly concentrated cells and were sharply separated from the surrounding dermis. The epidermis in the areas occupied by the tumors was absent and aggregates of cellular debris in eosinophilic fluid covered an ulcerated surface. No clear capsule was formed around the nodules and infiltration of tumor cells was often seen in the adjacent dermis (fig. 5). Only a pseudo-capsule from condensed fibers tended to form in certain areas. The epidermis in the surrounding area appeared well-preserved.

Discussion

Congenital lymphocytic leukemias in cattle, which seem to be closely related to those observed in man, appear as sporadically in cattle as they do in man.^{1,3,27,48} Based on the extremely rare incidence of leukemia in bovine fetuses of normal dams, it is probable that even the sporadic cases of malignant lymphomas have either been mistaken for infections or have been entirely overlooked.

The type of cells forming this tumor, although in many cases very anaplastic, resembles lymphoblasts. Since there is little, if any, indication of a reticular hyperplasia and not a single indication of a circulation of tumorous cells in the blood vessels, the term lymphoblastic lymphoma is considered to be the most appropriate and is used in the present paper according to Gall and Mallory's¹⁵ classification.

It is difficult to determine the original site of development since this tumor har-

bors features of both a multicentric and a metastatic origin. The development of distinct nodular masses compressing the adjacent parenchyma in several organs normally devoid of lymphoid or reticular tissue seems to point to a metastatic origin. In view of the major expansion of the tumor in the lung, it could be speculated that this organ was the original site of malignancy. However, the sharply circumscribed nodules suggest an embolic origin. It is also probable that either the walls of the abomasum⁴⁶ or the lymph nodes of the gastrointestinal tract, which were not available for examination, marked the initial site of malignancy.

The mechanism of the development of such a tumor in a fetus is not known. In the present case, cranial bone malformation was evident, an anomaly which could be compared with mongolism of human infants, which is associated with congenital leukemias.^{3,22} The anomaly factors—a basis for speculation—which could have been responsible for the malformation, might also have been contributory in the blood dyscrasia if the extraordinary liability of the hematopoietic system in infants is considered.^{3,22} This might account for the striking predominance of the myelogenous type among congenital leukemias in man.^{27,39,45,48} But in the present case it is difficult to offer an explanation for the association of bone malformation and lymphoblastic leukemia, unless the conclusion²² concerning mongolism, *i.e.*, that no anatomic system can escape from at least occasional anomalous development, is extended here.

In the present case, the maternal influence which could have contributed to the onset of the leukemic process is not apparent. Since there are other cases of normal calves born to leukemic dams,^{20,24} the presence of a blood dyscrasia in the dam does not always appear to be of etiologic significance in the bovine fetal leukemia. Yet assuming that in cattle, contrary to what happens in man and mouse,^{6,13} the placental barrier may be permeated by infiltrating malignant lymphoid cells, the possibility of a virus origin^{8,11,30,32} of this neoplastic condition cannot be completely excluded, although hardly sustainable in the present case.

The influence of heredity,^{19,31} environment,^{4,30} organic poisons,^{5,40} and allergy^{18,29} should be considered in determining the etiology of this neoplastic condition. It

would be of great significance to follow the course of life of the dam and its progeny and to investigate the hereditary anlage of the sire for a possible clue to the solution of the complex problem of the etiology of bovine leukemias.

Summary

A lymphoblastic lymphoma was diagnosed in a stillborn fetus expelled by a normal primiparous Shorthorn cow, at the eighth month of pregnancy. This is believed to be the first case of its kind reported in veterinary literature.

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Advice on Colic Prevention

Colic in horses can be minimized if owners will keep the following 7 precepts in mind:

- 1) Feed healthy, wholesome, and clean feedstuffs.
- 2) Observe regular feeding times, and feed in proper amounts in relation to exercise or work.
- 3) Provide a clean and preferably constant supply of water.
- 4) Make any change in feeding that is necessary gradually, taking several days to effect a change-over.
- 5) Study each horse's individual feeding habits and requirements and meet them as far as possible. No 2 horses are exactly alike.
- 6) Make daily observations of each horse's feces, noticing the amount, color, consistency, odor, and texture. Changes in any of these may herald an attack of colic and give warning of alimentary dysfunction.
- 7) Never underestimate the need for constant control of parasitic worms.—*Anim. Health (Nov., 1959)*: 21.

Griseofulvin in Acute Cattle Ringworm in Man

Systemic treatment with 1 Gm. of griseofulvin daily appeared to be the preferred treatment for acute inflammatory cattle ringworm infections of the human skin. The minimum effective dose and the optimum dose of the drug have yet to be established. The duration of the infection does not seem to have any bearing on the response to treatment.—*Brit. M. J.*, 2 (1959): 286.

Desiccated Chicken Sarcoma

Viable for Twenty Years

E. L. STUBBS, V.M.D.
F. G. SPERLING, V.M.D., PH.D.

DESICCATION has been known for a long time to be a suitable method for the preservation of disease-producing agents, particularly viruses, but it is not known how long various disease agents can be preserved by this method. The availability of chicken sarcoma (strain 13), preserved by desiccation from the frozen state for 20 years, made possible the injection of this dried material to determine whether it was still active. Injection into day-old chicks proved its viability.

The transmission of fowl leukosis with blood desiccated from the frozen state was reported in 1935.¹ Tests were made in 6 groups of chickens at 2, 89, 283, 365, 442, and 932 days after desiccation. The desiccated material retained its activity in the dry state for as long as 932 days. Lack of available material precluded further tests.

Material and Methods

A chicken sarcoma was reported and designated "strain 13" in 1935.² It was described as a mixed strain, closely related to leukosis. Injected locally, it produced a tumor at the point of injection and, when it metastasized, it produced sarcomatosis of the blood-forming organs, the liver, the spleen, and sometimes the bone marrow.

Lack of financial support forced work with strain 13 to be discontinued; but in 1938 some of this tumor material was minced, frozen, and desiccated from the frozen state *in vacuo* over phosphorous

pentoxide, sealed in glass tubes, and kept in a laboratory refrigerator.

Twenty years later, 20 newly hatched chicks were selected to test the viability of the desiccated tumor. The dried material was ground in a mortar with Ringer's solution.

The suspended desiccated material was drawn through a sterilized cotton plug with a syringe and 26-gauge needle to remove any large particles. This material was injected into a wing vein of the day-old chicks. Some leakage occurred at the injection site so that 1 month later 7 of the 20 chicks showed small tumor growths at the point of injection over the wing vein.

At this time, some of the fresh tumor growth was minced in Ringer's solution and injected into 10 cockerels, 2 months old. Some injections were made intravenously and some intramuscularly into the muscles of the breast. Six weeks after the day-old chicks were given injections, tumor growths over the wing veins had increased in size, and several chicks had died from tumor growths in the liver and the spleen.

Also, the 10 cockerels that had been given injections of the fresh tumor suspension were examined (making the first transfer), and 6 showed small tumor growths at the point of injection in the breast muscles. These tumors varied in size from 5 to 20 mm. in diameter. At this time, 1 of the original lot of chicks died from a large tumor. Some of this tumor was minced in Ringer's solution and injected into 5 new cockerels about 3 months of age. No tumors resulted from the injection of this material, probably because it was prepared from a dead chick.

Fifty-three days after injection of the original lot of day-old chicks, 2 chicks remained alive, each with tumors at the point of injection over the wing vein. One

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This work was aided by the Goldhaft Poultry Research Fund and by a grant from the U. S. Public Health Service.

of these was killed to carry out additional transfers.

At this time in the group of 10 cockerels, of which only 6 showed "takes," 1 cockerel was dead with a large tumor in the breast muscle. Six days later, another cockerel of this group died with a large tumor in the breast muscle. Sectioning showed that this tumor had degenerated, having become soft and fluctuating because of the presence of serum and blood. On necropsy, the abdominal cavity was found to contain multiple, soft, shiny, rapidly growing tumors.

These soft tumor growths had extended from the breast muscles through the abdominal wall into the abdominal cavity. Four days later, another cockerel died with a large tumor over the entire left breast. This tumor was soft and was discolored dark red-black from hemorrhage in its center, which had degenerated with ruptured blood vessels.

Finally, the last of the original group of day-old chicks, injected about 2 months previously, was unable to stand. It was killed and necropsy revealed a large breast tumor and a large spleen that was mottled with tumorous infiltration and pockets of blood.

These injections proved the viability of the desiccated tumor.

Discussion

The tumors produced by the 20-year-old desiccated material grew rapidly, were firm, and contained stringy myxoid material. The myxoid substance was shiny and glistening, so that when a tumor was cut or scraped the myxoid tumor was sticky and stringy. The tumors that did not grow rapidly remained firm and circumscribed. The tumors that grew rapidly became soft and discolored, causing bulging of the breast and fluctuation on palpation. When sectioned, such tumors showed accumulation of myxoid, stringy fluid. Sometimes the fluid resembled blood but it did not clot, and when drained out showed rapidly proliferating, shiny, gray tumor tissue around the boundaries of the cavity. Removal of the breast in some instances showed similar, soft, gray, shining tumors growing over the thoracic pleura.

Liver tumors, resulting from metastasis or from intravenous injection, were disseminated, ranging in size from barely visible to 5 cm. across. These resembled hematomas, were a dark blood color that contrasted sharply with the surrounding reddish brown liver tissue.

The splenic tumors seemed more diffuse in character and often resulted in enlarged spleens. Some spleens were very dark in color and, when sectioned, showed pockets of blood. The enlarged spleens frequently ruptured causing death from hemorrhage.

The gross changes were the same as those seen in the tumors first found in 1933. Microscopic examination of the tumors showed the same rapidly proliferating characteristics as reported in 1935.²

Summary

Desiccated material prepared from a chicken tumor, sarcoma strain 13, stored in a laboratory refrigerator for 20 years, was available for test of its preservation by desiccation. The tumor had been minced, frozen, and desiccated from the frozen state. It was reconstituted by grinding in a mortar with Ringer's solution. The reconstituted material was injected into day-old chicks. Tumors resulted from the injections, proving the activity of the desiccated material, and the tumors were propagated in series.

Tumors grew readily in the muscle tissue of the breast. Tumors starting at the point of injection grew rapidly, killing the chicks. Metastasis occurred in the liver and spleen.

Multiple tumors were found in the liver and spleen, with enlargement, and often resulted in rupture with fatal hemorrhage. The tumors appeared grossly and microscopically identical to strain 13 as described in 1935. The causative agent was preserved by desiccation for 20 years.

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Parakeet and Canary Practice

R. H. LEONARD, D.V.M., M.S.

PET BIRDS in this country have increased so rapidly in the last few years that the number of parakeets alone is almost equal to the number of dogs or cats. Pet bird owners are potentially as large a part of small animal practice as any other species. However, veterinarians generally appear unsure to the bird-owning client and are often reluctant to even try to solve disease problems in birds when they are presented for medical care.

A basic knowledge from which to make a diagnosis, and a knowledge of simple but effective treatments for common ailments, will help veterinarians render much of the service required by these clients.

Fees should be commensurate with the time and skill involved, as in any other phase of practice.

No effort is made here to cover every problem that occurs in treating parakeets and canaries, but a few conditions which commonly cause difficulty will be discussed.

Loss of Feathers

Loss of feathers is probably the most common ailment encountered and can be easily differentiated from normal molts by the absence of pinfeathers as well as by duration of the feather loss. Usually there is no skin irritation. The legs, breast, and sides under the wings are first and most severely affected.

Treatment with 0.5 mg. of repositol testosterone injected between the 2 layers of skin in the web of the wing has given fa-

vor able results this is the only site that I recommend to make any injection in parakeets and canaries). The injection should be repeated weekly.

Some benefit is derived by these birds from a daily pinch or two of a vitamin-mineral supplement on the seeds.

This same treatment will aid in correcting voice changes and loss of voice. Two injections given at 3-week intervals are usually all that is necessary.

Birds that pluck their own feathers are suffering from boredom 90 per cent of the time and only 10 per cent of the time from other causes. I have never had a bird fail to respond when the cage was moved outdoors during the day. Of course, protection is needed from the weather and other animals. When it is impossible to place the bird outdoors, locating the cage near a large mirror or window may help. Providing a companion bird sometimes serves the same purpose. These birds apparently need something to hold their attention in order for them to remain content. Parasites are seldom a factor in depluming cases.

Mites

The importance of mites in birds kept as pets is greatly overemphasized. Sanitation in pet bird cages is generally good, while mites thrive best in filth. There is no mite that cannot be seen with the naked eye when a white card is placed in the cage or the roost pole is wrapped with white paper.

When mites are found, the owner should be instructed to buy a new roost pole, and paint the old one with Blackleaf 40. The bird can be induced to roost on the treated

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pole for 3 hours once a week by setting the cage in a dark closet during the day when the owner can inspect the bird occasionally to see that it is not affected severely by the treatment. The pole should be repainted each time it is used and used at least 3 times.

for splinting; 1 or 2 layers will hold the femur or tibia. Care must be taken not to apply the tape too tightly because the bird will not tolerate it that way. Wing fractures usually are best immobilized by taping both wings snugly to the body using cotton padding to get good apposition of the fracture ends. Seven to 10 days is long enough to leave any splint on a bird.

Fatty Tumors

Fatty tumors, commonly seen on the neck, shoulders, and breast, are easily removed. I prefer to operate without anesthesia, using a No. 11 Bard-Parker blade to incise the skin. Then, by using a small hemostat, the tumor is removed by blunt dissection. Little hemorrhage occurs. No skin sutures are used. In my experience, birds pick at the sutures, and most birds will succeed in picking them loose before healing occurs.

Some shock occurs in the removal of large tumors when no anesthesia is used, but I have more success in controlling shock than I have with general anesthesia. Ethyl chloride to freeze the area works satisfactorily as a local anesthetic. In my experience, procaine infiltration has been fatal in every case. Birds cannot tolerate procaine. Even procaine penicillin often causes fatal shock.

Surgery

I use general anesthesia for amputations and other major surgery, using 2.0 mg. of pentobarbital sodium diluted with 0.25 cc. of water given by mouth. I repeat this dose in 15 minutes if necessary; the margin of safety is much greater orally than by injection. Birds fasted for 24 hours are relatively easy to anesthetize by this method.

Tumors involving the thin abdominal wall are dangerous to remove. I allow them to grow enough so that I can tie a nylon ligature around the base, not too tightly at first. Then I tighten it weekly. In this way, the blood supply to the tumor will be cut off, and eventually the tumor will drop off.

Fractures in birds respond well to treatment when they are simple; compound fractures usually require amputation or euthanasia. Adhesive tape alone is adequate

Diarrhea

Diarrheas are common in these pets, and many are due to excessive feeding of greens, paper, and sweets, especially toast and jelly. Elimination of these practices and administration of 1 drop twice daily of 3 or 4 per cent sulfamerazine directly into the beak usually gives favorable results.

When this treatment fails, I recommend feeding sour buttermilk twice in 1 day. Sour buttermilk flushes the intestine as a laxative, but should not be used more often than once a week.

Paralysis

Paralysis is common. Birds that fall off the perch, lay on their side, or have to hold with the beak as well as the feet to keep their balance are often paralysis victims. Nearly all of these that do not have a history of a preceding illness will respond to vitamin-mineral supplementation. I use a syrup containing hematine vitamins and minerals, giving the bird a drop 3 or 4 times daily. Most birds, even acutely ill ones, will take this type of preparation from the end of a medicine dropper. Birds that still eat well will respond to a daily pinch of powdered vitamin-mineral supplement on the seed.

Egg Bound

Birds that are egg-bound are frequently encountered. The egg usually is still in the oviduct, but is easily palpated. These birds stand up especially straight and do not eat.

I use heat, 110 to 120 F. for 20 minutes at a time, keeping close watch so prostration will not occur, and administer a few drops of mineral oil into the cloaca. The egg is usually passed within the first 20 minutes.

This heat can be most easily provided by the use of a light bulb behind a shield since birds lay eggs best in the dark. Increase the heat slowly because fatigue and subsequent shock, with lowered body temperature, is often the cause of this problem.

Sometimes a yolk is free in the abdominal cavity and produces peritonitis. The bird stands upright as if egg-bound, but the mass is soft and lower in the abdominal cavity. The bird is seldom as acutely sick as when egg-bound and usually not off feed. I aspirate these, using a 20-gauge needle and inject 1 or 2 cc. of 5 per cent sulfamerazine intraperitoneally through the same needle and repeat the procedure in 3 or 4 days.

Miscellaneous

Scaly face and scaly legs may be due to different causes, but they respond to the same treatment. I use an emulsion made of half mineral oil and half acriflavin solution

(1%) to sponge on affected areas twice weekly.

There are specific infectious diseases that affect pet birds, such as bronchitis, Newcastle disease, and psittacosis, but in the average small animal practice these are rare.

For treating colds and pneumonia, I have found whisky better than antibiotics. I dilute the whiskey with 10 parts of water, put it on bread, and give it to the bird every 2 hours. Of all the antibiotics, oxytetracycline gives the best results. I administer it as a liquid on bread or as a powder mixed with fresh orange, hamburger, or cheese. The dose is 5 mg. twice a day, considering that there will be some waste involved in the process of administration.

Overgrowth of the upper beaks of parakeets is usually hereditary and occurs when birds are several years old. One may trim these every 3 weeks, but most can be corrected by cutting transverse grooves on the under side of the upper beak with a small 3-cornered file. Two or 3 grooves cut as deep as possible without causing bleeding are adequate. This treatment results in a beak with increased curvature after 2 or 3 treatments, and trimming may be discontinued for sometimes as long as a year.

Psittacosis Responds to Chlortetracycline

Psittacosis can be controlled in parakeets by tetracycline compounds given in medicated feed or by injections. The bird is fed hulled millet seeds impregnated with 0.5 mg. of chlortetracycline per gram of feed for 3 to 5 days, followed by regular feed for 1 or 2 days. This medication schedule, continued for 30 days, has achieved almost complete, but not always immediate, recoveries.—*J.A.M.A.*, 172, (1960): 165-166.

Natural Occurrences of

Salmonella dublin in Arizona

A Preliminary Report

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SALMONELLA DUBLIN, a bacterium generally considered as occurring only infrequently in the United States, was isolated in 19 epizootics within 1 year in Arizona livestock. Isolations were made from 7 species of animals including cattle.

Although unpublished reports of isolations of *S. dublin* may have been made at other laboratories, a search of the literature failed to reveal reports in this country of isolation of *S. dublin* from horses, rabbits, dogs, mice, chickens, or doves. The isolations made at this laboratory are believed to be the first reported in these species in the United States.

History and Occurrence

The apparent pathogenicity and prevalence of *S. dublin* in man and animals in other parts of the world are well documented.^{4,6,14,16,20,33-35,39,31,32} In 1929, *S. dublin* was serologically separated from *Bacillus enteritidis* (Gartner's bacillus) and established as a separate species.³³ Since that time it has been found in all parts of the world.

In contrast to the frequency of reports in foreign countries, only occasional references to *S. dublin* epizootics could be found in the literature of this country. Published salmonellosis surveys revealed that only a few cultures of *S. dublin* had been

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isolated.^{1,2,5,11,12,18} In the United States, according to a 16-year survey published in 1949, only 45 of 13,516 Salmonella cultures were *S. dublin*. Ten of these were from cattle. Other isolations reported in this survey were from foxes, a turkey, and a canary.⁹

Epizootics of *S. dublin* in California cattle were reported in 1954.^{4,8,22} In 1958, the authors reported isolation of *S. dublin* from Arizona cattle.²³

In contrast to the 45 isolations which were reported in the 16-year survey, 33 isolations of *S. dublin* were reported from animals in this country in 1958.²³ Nineteen of these were from cattle, 5 from chickens, 3 from mink, 2 from dogs, and 1 each from a mouse, horse, rabbit, and dove. These isolations were all derived from the western part of the United States—4 were from California cattle; 4 additional isolations were from Utah, 1 from cattle, and 3 from mink. One isolation was from chickens in New Mexico. The remaining 24 isolations were made from the 19 epizootics studied by the authors in Arizona.

Isolations of *S. dublin* in man, in common with those in animals, have been confined mainly to other parts of the world. Prior to 1948, only one isolation from man was reported in this country.¹² However, in 1958, an outbreak occurred in man in California and was traced to a certified raw milk dairy.²⁶

Methods

The specimens used in this study were presented to the laboratory as routine accessions for diagnosis. No effort was made to select herds, flocks, or individual animals. Complete histories were recorded on each accession.

The calves were presented to the laboratory by veterinary practitioners.

Standard procedures for enteric bacteriologic studies were used.¹³ Methods were those described by the authors.²³ Direct plating was done on tryptose, blood agar, or both.

The following tissues were used for bacteriologic

study: liver, lung, joint fluid, blood, spleen, kidney, brain, bile, urine, prefemoral lymph node, prescapular lymph nodes, and mesenteric lymph nodes. When possible, a minimum of 4 tissues was selected for study. These were varied in order that an equal representation of tissues could be studied. In no instance was fecal material cultured and no attempt was made to isolate and identify viral agents.

Bacteriologic Findings

*Salmonella dublin** was recovered from tissues of 15 calves. The isolations were made from all tissues cultured, except brain tissue. In calves, the highest incidence of isolation was from liver tissue and prescapular lymph nodes, whereas spleen tissue showed the lowest incidence of isolation.

In other species, *S. dublin* was recovered from liver, heart, air sacs, and unabsoed yolk sacs of chickens; and from the prefemoral lymph nodes, liver, and spleen of dogs. In mice, isolations were made from liver and kidney tissue; in rabbits, from liver and spleen. The isolation from doves was made from liver tissue, and the isolation from the equine fetus was from stomach contents and peritoneal fluid.

With one exception, a focal lung abscess in a calf, all isolations were made from enrichment mediums. This exception was an isolation made by direct plating on tryptose agar.

Biochemical reactions were those previously reported by the authors.²⁹ Cultures presumptive of *Salmonella* were picked for group serotyping.^{**} In instances where all cultures from various tissues were of the same *Salmonella* group, only one culture picked at random was forwarded for species serotyping.[†] Otherwise, a culture from each *Salmonella* group was selected for typing.

RESULTS

Calves

Clinical Signs.—Clinical signs seen in calves with *S. dublin* infection generally were those reported by the authors and in-

cluded dehydration, muscular weakness, recumbency and, in some cases, an uncontrollable fetid diarrhea.²⁹ Additional signs seen in calves in this study were central nervous involvement and an occasional enlargement of the hock and knee joints. Central nervous involvement was manifested by incoordination and nystagmus.

Necropsy Findings.—Respiratory organs were grossly normal with the exception of occasional consolidation of the extreme tip of the apical lobe of the lung and petechiae. Exudative processes were not observed in the bronchioles or bronchi. In calves that had died before being brought to the laboratory, lung congestion was observed and was always conspicuous in the lobe on the side on which the calf had been lying when it had died. This was believed to be the result of hypostasis due to impending death. This lung condition was not seen in moribund calves killed immediately before necropsy.

Petechiae, erosions, and a gastritis, varying from catarrhal to hemorrhagic, were observed regularly in the abomasum. The erosions were pinpoint to 3 mm. in size and colored black in some of the calves. Petechiae were observed in all parts of the abomasum.

Enteritis was inconstant. In some calves, the wall of the intestinal tracts were edematous with large amounts of mucus in the lumen. Ecchymoses were observed on the mucosa of the large bowel, but only occasionally was blood seen in the intestinal tract or feces.

Gross enlargement of the mesenteric lymph nodes was observed consistently. This enlargement was of such a size and coloration that the lymph node chains could easily have been mistaken for loops of the small intestine. Accompanying peritonitis also was seen with fibrin shreds in an excess of straw-colored, frothy peritoneal fluid.

Some degree of liver damage was seen in all calves. In some calves, only subcapsular petechiae were seen, others showed disseminated necrotic foci, ranging from pinpoint to 2 mm. in size throughout the entire liver tissue. Examination of liver tissue sections revealed necrotic foci of all livers examined. These necrotic nodules were present in livers showing gross necrotic foci, as well as in those showing only subcapsular petechiae.

Liver discoloration was seen regularly.

*This species of *S. dublin* was typed.

**Group serotyping was performed by the Arizona Public Health Laboratories, Phoenix.

†Species serotyping was performed by the Communicable Disease Center, Chamblee, Ga.

This coloration varied from occasional irregularly rounded, burnished golden areas in some livers to complete discoloration in others.

With the exception of occasional petechiae, spleens were apparently normal.

In some calves there was an involvement of the hock or knee joints. In some instances, the joint capsules were distended, with an excess of straw-colored joint fluid in which fibrin shreds were seen. Occasionally, gross enlargement could be seen.

Prophylactic medication is standard management practice in this area and, in some instances, it is relied on to substitute for good sanitation practices. Many of the calves studied probably had been on a treatment schedule from the time they were born. Sustained treatment possibly could alter pathologic processes seen in the calves.

Poultry

Salmonella dublin was isolated from 4 flocks of chickens. These isolations were made from birds in a laying flock of 100 birds; a broiler operation of 90,000 birds; and 2 flocks of 2-week-old chicks, one of 13,000 birds, and the other of 300.

Clinical Signs and Lesions at Necropsy.—Clinical signs and lesions seen at necropsy in the 2-week-old birds were similar to the classical "bacillary white diarrhea" of chicks caused by *Salmonella pullorum*. In the broiler flock, clinical signs were cyanotic combs, dehydration, high temperature, and diarrhea. At necropsy, petechiae were seen on the pericardium, abdominal fat, and serosa of the intestinal tract. White necrotic foci were seen in the livers. A severe catarrhal enteritis was seen in the proximal third of the intestinal tract.

Clinical signs and pathologic changes seen in the laying flock were vague. Only 1 bird was examined.

Dogs

Salmonella dublin was isolated from 2 dogs, a mature Greyhound and a Weimaraner pup.

In the Greyhounds, the first dogs to sicken were adults racing at a local track.

Later, dogs of various ages in the kennel sickened, and 17 of 20 died. This kennel consisted of 11 year-old pups, 8 mature dogs, and an aged German Shepherd Dog house pet. The mature dogs had been immunized against distemper and hepatitis.

Salmonella dublin was isolated from 1 of these dogs. Uncontrollable diarrhea was present. Central nervous involvements were observed in some.

An additional isolation of *S. dublin* was made from a 6-month-old Weimaraner with frank abscessation of the peripheral lymph glands, lungs, and liver.

Horses, Mice, Doves, and Rabbits

Salmonella dublin was isolated from a 3-month aborted equine fetus. There was a history of abortions and poor breeding performance in this herd.

Salmonella dublin was isolated also from young rabbits housed on wire. The parent rabbits had been housed on wire for at least 2 years. Clinical signs were a rapidly progressing diarrhea. At necropsy, the intestinal tract was filled with a blood-tinged, watery exudate. Examination for intestinal parasites was negative.

One additional isolation of *S. dublin* was made from a white-winged dove. (*Melopelia asiatica mearnsi*). This was an incidental isolation made from a dove that was collected in a study of *Plasmodium* infection in this species.

A rather peculiar situation exists regarding the isolation of *S. dublin* from mice. A chronic respiratory-like disease, associated with anemia, had been responsible for heavy losses in 8- to 17-week-old replacement birds in a 40,000 caged-layer operation. This disease syndrome had been encountered in each successive group of replacement birds for several months.

Repeated attempts to isolate *Salmonella* organisms from this flock had been unsuccessful, although serums from sick birds were serologically positive to *S. pullorum*.

A visit to the ranch revealed that it was being overrun by mice. Mice collected on this ranch were found to be harboring *S. dublin*. When an active mouse eradication program was undertaken, the disease syndrome in the birds disappeared and has

not reappeared in 6 months. The exact etiologic agent of the disease is not known.

L

DISCUSSION

Incidence, Morbidity, and Mortality

Calves—It should be emphasized that this preliminary study included only a small number of animals. However, the results are believed to be significant, since *S. dublin* had not been reported previously in any species in Arizona.

TABLE 1—Bacterial Isolations from Individual Calves

Age	Calves (No.)	Pseudo- Coli- forms	monas spp.	Salmon- ella spp.	Neg.
1-3 days	14	6	2	3*	3
4-14 days	15	5	2	3**	5
15-90 days	22	2	2	16†	2
Total	51	13	6	22	10

Salmonella anatum* (1); *S. newport* (1); *S. montevideo*, *S. newport* (1). *Salmonella newport* (1); *S. san diego* (1); *S. dublin* (1).

†*Salmonella san diego* (1); *S. typhimurium* (1); *S. dublin* (14).

A total of 51 calves representing 22 herds were examined.

With one exception, a 9-day-old calf, all *S. dublin* isolations were made from calves in the 15-to-90-day age group (table 1).

Salmonella dublin was isolated from 15 calves (29%), representing 9 herds (42.8%).

There were 22 calves from 14 herds in the 15- to 90-day age group. *Salmonella dublin* was isolated from 14 (63.6%) representing 8 herds (57%).

Two additional calves in this group were harboring *Salmonella*—*S. san diego* in one, *S. typhimurium* in the other. In this group, there were 16 calves (66%) with salmonellosis. Of those with salmonellosis, *S. dublin* was isolated from 87 per cent.

Average calf mortality in the herds infected with *S. dublin* was 48 per cent. Highest mortality in any infected herd was 85 per cent, while the lowest was 30 per cent. Morbidity was almost 100 per cent in one herd, with 65 per cent the average morbidity in all herds. No adult cattle were known to be involved.

Poultry—All the epizootics in poultry were in ground-type housing operations. Only a small percentage of the total flocks examined at this laboratory harbored *S. dublin*.

Mortality in both flocks of the 2-week-old chicks was approximately 9 per cent. In one of these flocks, chicks were housed in pens of 2,000 under a common roof. The disease spread slowly from sick birds in 2 adjacent pens to birds throughout the entire flock.

In the broiler operation, 8-week-old birds were housed in groups of 10,000. Of the 90,000 birds, 30,000 died during the course of the epizootic. At its peak, losses exceeded 1,100 birds per day.

In the broiler flock, the disease occurred during extremely hot weather and the owner had administered magnesium sulfate to the birds on the second day. It would be hazardous to incriminate *S. dublin* as the sole cause of high mortality in this flock. It may be assumed that heat and mistreatment were largely responsible for the heavy loss in this flock.

The isolation of *S. dublin* in the laying flock was made from a single bird. Clinical signs were vague. The owner of the flock stated that she had lost 65 birds from a flock of 100.

Mortality in experimentally inoculated birds was similar to the mortality seen in the 2-week-old chicks.

Other Occurrences—Mortality in rabbits approximated 10 per cent and was confined to young rabbits.

Treatment and Control

Little information could be found in the literature of this country regarding treatment of *S. dublin* infection. Chlortetracycline³ and neomycin⁸ were reported to produce an excellent response in calves affected with *S. dublin*.

Foreign workers report favorably on the use of chloramphenicol,²¹ sulfathalidine,²¹ furazolidone,²¹ and autogenous vaccines.²⁰

While treatment of *S. dublin* infections was not studied under controlled conditions, practicing veterinarians reported that antibiotics, sulfonamides, homologous serums, and bacterins had little apparent value in controlling the disease in calves.

Evaluation of treatment in chicks could not be made since this treatment was under lay supervision. However, in the broiler flock, nitrofurazone administered on the third day seemed to have little effect on the mortality.

In an affected dairy, strict sanitation and management were apparently successful in controlling the disease. This success was accomplished by providing clean disinfected maternity stalls for parturient cows, and individual flyproof pens for the calves.

Epidemiology

Prior to Jan. 3, 1958, when an isolation was made from a calf, *S. dublin* had not been reported in Arizona livestock. Peaks of the occurrences of epizootics were during the months of October and November. Initial isolations from other species in 1958 were: dog—June 2; chickens—July 7; rabbit—October 5; dove—October 25; mice—October 30; equine fetus—November 1.

Two distinct types of operations were involved in the cattle epizootics. Four were in calves in grade A dairies and the other 5 were in calves in "heifer replacement" operations.

Two of the dairies had imported adult animals during the previous year. No cattle had been added recently by the other two dairies. All 4 dairies were attempting to raise replacement heifers within the herds.

No history of interchange of livestock among the infected herds in Arizona could be established. In no instance were calves from the affected dairies involved where the disease occurred in heifer replacement operations.

In one of the affected heifer replacement operations, calves were purchased from 3 local dairies, all of which were investigated; *S. dublin* was not found.

In epizootics of *S. dublin* in this area, sanitation was sometimes inadequate and, in other cases, sanitation and management were good. In 1 heifer replacement operation, sanitation and management were exceptionally good. Calves were kept in individual isolation for 3 weeks, then penned in groups of 8. An adequate program of prophylaxis was followed. Calf losses in

this operation exceeded 33 per cent even though an aggressive medication program was instigated under veterinary supervision.

Management and sanitation in the grade A dairy herds were considered average in 3 herds, while in the fourth, sanitation was inadequate. Peculiarly, the latter herd experienced the lowest calf mortality of any dairy herd.

Salmonella dublin infection occurred in poultry flocks in 4 widely separated areas. No relationship among the flocks was established regarding origin of chicks, water, feed, supplies, or geographical location.

The epidemiology involving isolation of *S. dublin* from dogs, horses, chickens, mice, and rabbits is vague.

Feed sources and animal importations were suspected in some epizootics. Feed, water, milk, and milk substitutes were examined in some cases. Attempts were made to determine presence of carrier animals by fecal examination and serologic testing. *Salmonella dublin* was not isolated in any of these studies.

Isolation from doves, although made from only 1 bird, indicates another possible reservoir of infection for herds of this country. These birds are indigenous to southern California, southern Arizona, and New Mexico. They migrate to and beyond Mexico City. *Salmonella dublin* infection may be an enzootic disease in Guatemala.⁹

In no instance was the source of infection conclusively proved in any epizootic. This phase of the epidemiology of *S. dublin* awaits further investigation.

Public Health Significance

Foreign literature repeatedly stresses the fact that in areas where *S. dublin* is enzootic in animals, particularly in cattle, infections in man also occur. Contaminated milk and meat have been incriminated as sources of infection in man.^{6,24,26,31} *Salmonella dublin* is known to be shed in the milk of infected cows,¹⁶ and in 1958, an epidemic in man was reported in California and was traced to a certified raw milk dairy.²⁸ According to this report, there were 19 suspected and 11 laboratory-proved cases. *Salmonella* organisms isolated from this herd were confirmed and *S. dublin*.¹⁰

Fortunately, to date, only 1 case in man has been reported in Arizona.⁷ This person was a transient worker from California.

General Discussion

Preliminary observations of mortality and morbidity, treatment response under field conditions, and results of inoculated experimental calves indicate that strains of *S. dublin* in this area produce an extremely destructive disease in calves. These strains of *S. dublin* are the same serologic types that occur in foreign countries.²⁷

Salmonellas other than *S. dublin* were encountered in this study; however, a distinct age differential was seen in these calves as well as a difference in gross pathologic findings. Extensive lung involvement was seen in calves infected with other *Salmonella* species, while this condition was not seen in calves with *S. dublin* infection.

Distinctive liver lesions, gross enlargement of the mesenteric lymph nodes, and gastritis were observed regularly in all calves infected with *S. dublin*.

During the latter part of this study, tentative diagnoses of *S. dublin* infection in calves were made from history, age, and necropsy lesions. Diagnoses were confirmed by isolations of the organism from various tissues of the calves.

Observations of clinical signs, age incidence, course of the disease, and necropsy lesions, both in naturally infected calves and in inoculated experimental calves, indicate that *S. dublin* may produce a characteristic disease entity in calves which may be distinctly separate from other salmonelloses.

Foreign workers point out that *S. Dublin* is enzootic rather than sporadic.^{18,19} *Salmonella dublin* has been found to be viable in dried feces for 3 years.¹⁹ Once a farm becomes infected, the disease occurs year after year on the same farm. Adult cattle have been shown to shed *S. dublin* in the feces for 3 years after apparent recovery from infection.¹⁴ Calves may also become carriers and shed the organisms in their feces for long periods of time.¹⁹

Undetected carrier animals probably play an important role in dissemination of

the disease. This may prove to be a particularly vexing problem when the changing trends in the livestock industry, particularly dairying, are considered. For example, larger numbers of animals are being confined to smaller areas for economy and efficiency of production. In Arizona, heifer replacement operations are becoming popular. Mass movement of livestock to and from all parts of the country affords excellent opportunity for dissemination of disease.

An explosive epizootic of *S. dublin* in calves in a dairy herd (85% mortality) closely followed importation of adult animals from a known infected area outside of Arizona.

Prior to 1948, all reported isolations of *S. Dublin* in cattle were from California. While not directly concerned with this paper, the explosive spread of vesicular exanthema of swine in 1952 is indicative of the danger of delimiting an infectious disease to any specific area. This error in judgment should not be repeated and the potential spread of *S. dublin* to noninfected areas and herds by movement of undetected carrier animals should not be ignored.

Conclusions

- 1) *Salmonella dublin* may already be far more widespread in the United States than has generally been accepted.
- 2) Species of *S. dublin* which occur in this area can cause an extremely destructive disease in calves.
- 3) The isolations from other species indicate additional reservoirs for *S. dublin* and potential sources of infection for man.
- 4) The isolation of *S. dublin* from horses, dogs, mice, chickens, and rabbits is believed to be the first reported from these species in this country.
- 5) Preliminary observations of clinical signs, age incidence, necropsy lesions, and histopathologic studies indicate that *S. dublin* may produce a characteristic disease entity in calves which may be distinctly separate from other salmonelloses.

Summary

The prevalence and apparent pathogenicity of *Salmonella dublin* in man and animals, especially in calves, in other parts of the world are well documented. When *S. dublin* was isolated at this laboratory and a search of the literature showed few reported cases of *S. dublin* in the United States, a study of the prevalence of the disease was undertaken.

Seven species of animals were involved in the 19 epizootics of *S. dublin* studied. Nine were in cattle, 4 in chickens, and 2 in dogs. One epizootic occurred in horses and 1 in domestic rabbits. In addition, *S. dublin* was isolated from wild mice and a dove. No reference could be found to previous isolations in this country of *S. dublin* from horses, mice, rabbits, dogs, doves, or chickens.

Calf mortality reached 85 per cent in one of the 9 dairy herds in central Arizona, while average mortality was approximately 48 per cent. Heavy losses also were encountered in poultry epizootics and in a kennel of Greyhounds. Treatment with antibiotics, sulfonamides, antiserums, and bacterins was of little value. Inoculation of experimental animals indicated that *S. dublin* is capable of producing an extremely destructive disease.

In the past, published reports of *S. dublin* in this country were infrequent, and mainly of the survey type. The few recorded cases of *S. dublin* were limited mainly to cattle in California, and to foxes. Before 1948, no cases had been reported east of the Rocky Mountains.

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Humane Slaughter Program

K. F. JOHNSON, B.S., D.V.M.

IN 1958, the President signed the Humane Slaughter Bill making it law, which brought into being a new concept in man-animal relationships. Humane slaughter laws in this country had been traditionally an important part of the over-all anti-cruelty-to-animal program skillfully applied by devoted members of humane organizations. Now, a federal law requiring the establishment of a national code or standard for handling and slaughtering food animals has been enacted.

The proposed legislation was introduced in May, 1955, culminating in the final enactment of the law as we know it today. Basically, the law establishes a United States policy with respect to handling and dispatching of food animals. It reads as follows: "Slaughtering and handling of livestock in connection with slaughter shall be carried out only by humane methods."

In its deliberations, Congress identified 2 humane methods of handling and slaughtering of livestock: "In the case of cattle, calves, horses, mules, sheep, swine,

and other livestock, all animals are rendered insensible to pain by a single blow, gunshot, or electrical, chemical, or other means that is rapid and effective before being shackled, hoisted, thrown, cast, or cut"; or "by slaughtering in accordance with ritual requirements of the Jewish faith or any other religious faith that prescribes a method of slaughter whereby the animal suffers loss of consciousness by anemia of the brain caused by the simultaneous and instantaneous severance of the carotid artery with a sharp instrument."

The first of these methods was intentionally broad in scope. The details were to be developed by study and research by the Secretary of Agriculture and on advice of the federal Humane Slaughter Advisory Committee.

Compliance with Humane Slaughter Law after its effective date on July 1, 1960, is mandatory only when a packer sells his livestock products to an agency of the federal government. The law does not include poultry.

Specifically, Congress directed the secretary and an advisory committee to designate exact methods of slaughtering and handling associated with them on March 1, 1959. The period between the designation

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tion date and the effective date in 1960 provides packers with the necessary time to secure and install equipment.

On Feb. 27, 1959, the secretary identified methods of slaughter and handling of livestock considered to be humane. These designations were based on the findings of veterinarians of the Meat Inspection Division, Veterinary Physiologists, Animal Husbandry Research Workers, and the Advisory Committee. They are: (1) chemical—carbon dioxide; (2) mechanical—powder or air activated mechanical stunners; (3) electrical—electricity; (4) gunshot—firearms.

With one exception, each method was declared acceptable for all species slaughtered. Carbon dioxide was found to be acceptable for sheep and swine only. Insufficient work had been done at the time the designations were made to determine the exact effectiveness of the gas on other species. On Aug. 12, 1959, carbon dioxide was declared by the secretary to be acceptable for calves.

Carbon dioxide and electricity were found to be acceptable providing they produced surgical anesthesia, while mechanical equipment and gunshot must produce immediate and complete unconsciousness with a minimum of excitement and discomfort.

Handling in connection with slaughter was given equal consideration with the slaughter methods. Regardless of the method used to produce insensibility, the humane slaughter designations provide that animals must be driven and handled with a minimum of excitement and discomfort.

When considering the fundamental objectives of humane slaughter, one singular goal was paramount: to bring about insensibility of the animal without immediate loss of vital organ function (principally of the heart). Thus, it was necessary that animal lose consciousness in a very short time with the heart still functioning to bring about rapid bleeding and ultimate death. Whatever the agent used, death could only be the result of bleeding, not of the agent.

A second requirement basic to any agent capable of producing insensibility is that its use could in no way affect or produce an unwholesome condition in the meat from the carcass or any of its edible parts.

Carbon Dioxide Anesthesia

As long ago as 1827, it was demonstrated that a dog exposed to an atmosphere containing carbon dioxide became anesthetized.¹ In 1904, carbon dioxide was first tried in the slaughter of food animals; however, these attempts were not satisfactory.² In 1950, the Hormel Company, Austin, Minn., began a series of successful experiments on pigs using carbon dioxide as an anesthetic agent.

The ability of carbon dioxide to produce anesthesia is by loss of function of the "consciousness center" of the brain because of the associated anesthetic properties of the gas and the markedly reduced supply of oxygen to the brain. This is accomplished before vital heart action ceases.

It is relatively cheap gas, commercially available in large quantities, nonflammable and, when used with properly designed units, offers no hazard to employees. Its specific gravity is greater than air and it is nontoxic. When used in proper dilution, it is relatively nonirritating. Furthermore, this gas is rapidly interchanged in the animal system with oxygen.

Several devices have been developed making use of the heavier-than-air principle of the gas. The equipment developed by the Hormel Company carries compartmentalized animals on a conveyor into and out of a recessed tunnel containing carbon dioxide gas and air. The tunnel is open at both ends and, by means of flexible impellers, the animals are retained in their respective areas within the chamber. Immediately after emergence from the tunnel, the animals are either shackled and stuck, or placed on a conveyor for prone sticking and bleeding. Equipment of this type is able to handle from 250 to 750 hogs per hour. An adaptation of the straight tunnel has been developed in Denmark for smaller operations. In principle, it is identical to the Hormel unit, but the tunnel is "U"-shaped, with the central portion of the U being depressed and both ends open and elevated. Source of gas for any of the units may be from liquid carbon dioxide or from temperature and pressure-controlled reduction of dry ice.

Concentrations of gas for hogs vary from 65 per cent carbon dioxide recommended by Danish workers³ to 85 to 90 per cent used by some packers in this

country. Although not confirmed here, it is the observation of the Danish workers that concentrations over 70 per cent produce stiffness in the carcasses after bleeding. Sheep, on the other hand, are somewhat more sensitive and require more exacting controls. Complete anesthesia with proper exposure time has been best produced at about 70 per cent carbon dioxide.

Exposure time is variable depending on gas concentration. The same is true depending on the species being anesthetized. Hogs require from 60 to 90 seconds to traverse an immobilizing tunnel; sheep and calves, 80 to 90 seconds.

After entry into the carbon dioxide atmosphere, the speed with which anesthesia ensues is dependent on the conveyor speed and gas concentration. Unconsciousness has been detected in pigs after 8 seconds at 85 per cent concentration, and in 15 seconds at 70 per cent concentrations. The induction phase in any concentration is short and without extreme violence. Lack of marked irritation is evidenced by the fact that the pig does not hold his breath, but rather a deep gasping type of breathing is consistently observed.

Compliance with Humane Slaughter Law after July 1, 1960, is mandatory when a packer sells to an agency of the federal government.

Recovery after carbon dioxide anesthesia in hogs requires about 65 to 70 seconds; sheep, from 45 to 55 seconds. Normally, animals are stuck in no more than 30 seconds after emergence from the carbon dioxide atmosphere. This allows ample time for dispatching the animals before earliest reflexes and consciousness returns. Postmortem examination of carbon dioxide-anesthetized hogs showed them to be normal and bleeding was complete. Histologic examination of tissues from carbon dioxide-anesthetized hogs failed to show any significant difference in the microscopic appearance of tissues from nonanesthetized hogs. The pH of meat from carcasses of carbon dioxide-anesthe-

tized hogs was 5.4; from nonanesthetized hogs, 5.65. Keeping quality of the meat is unaffected.

In either the straight-line or U-type tunnel, each animal requires $\frac{1}{4}$ to $\frac{1}{3}$ lb. of carbon dioxide for the production of surgical anesthesia. This represents a cost of slightly over 1 cent per animal.

Electrical Stunning

Since the time of Benjamin Franklin, the first proponent of electrical anesthesia, perhaps no other stunning method has undergone the research, discussion, and controversy that electricity has. The fascination of the unseen and the knowledge that electricity could produce anesthesia at a low cost in large numbers of animals has probably stimulated the search.

With its potentials, electricity has also had its undesirable characteristics. Improperly used, it is dangerous to the operator. Improperly applied, electricity has, and will, break bones and produce extensive hemorrhages in the animals to which it is applied. Also, an early worker with electronarcosis proved by self-application that electricity can, under certain outputs, produce paralysis or inhibition of motor mechanisms instead of anesthesia.⁴ Tissue changes brought about by early modes of anesthesia-producing electrical equipment were undesirable.

Since the passage of the Humane Slaughter Law, several types of electrical equipment have been developed for swine in this country. Immediate production of anesthesia and freedom from objectionable tissue changes can be accomplished by this equipment when properly used. The problem of animal restraint in connection with electrical stunning has been effectively solved by an ingenious foam rubber-covered, mechanically operated, squeeze chute.

A direct current charge stunning unit which produces an interrupted spike current delivering 750 to 1,500 ma. at 250 volts has been developed.⁴ A built-in device automatically regulates voltage output based on variables encountered in current supply and resistance of the animal being anesthetized. Thus, at a given setting, amperage remains constant and the voltage will vary as required. Best results

were observed to be at the 1000-ma. setting. Swift and Company, Chicago, has conducted extensive work in the field of electrical anesthesia with considerable success. However, specific information is not available for publication.

Time of application of the charge appeared to be most effective for a 1-second duration. Variables in spike rise and frequency of interruption make it possible to reduce this application to $\frac{1}{4}$ second and still produce anesthesia. Flow of electricity to each animal was present in an automatic timing device.

Sharp electrodes are placed on the animal's head, piercing the skin about 2 inches above the eyes and in the center of the frontal region. Unless the electrodes are accurately placed, short stuns or paralysis and pain may result.

Hogs stuck 5 seconds or less after stunning by this method show insignificant lung hemorrhages, while other viscera and muscles are completely free of this condition. The Danish Academy of General Sciences reports that the tissue hemorrhages, or so-called "blood splashing," is due to bursting of capillary walls apparently as a result of increased internal blood pressure.¹ A decrease or prevention of blood pressure build-up by reducing the time interval between stunning and sticking may in part explain the favorable postmortem picture now available.

Tissue changes in swine, other than those mentioned, were normal in all respects on postmortem examination. Keeping quality of the meat was satisfactory. Rates of kill exceeding 600 hogs per hour and as low as 50 have been reported using these electrical stunning methods. Cost of operation appears fractional per animal and stunning equipment is reasonable in cost.^{5,7}

Mechanical Stunning

Properly placed mechanical stunning equipment, whether skull penetrating or nonpenetrating, will produce unconsciousness in food animals rapidly and effectively. Manually swung hammers are difficult to place accurately on an animal's head, proper stunning is not consistent, and painful injuries are often inflicted.

Mechanical equipment can be accurately placed and can produce unconsciousness with no more effort than squeezing a trigger or touching an animal's head with a detonating pin. Power source may be compressed air or measured amounts of gunpowder. Several satisfactory guns, pistols, and other devices are available.

In the case of a skull-penetrating instrument, a solid metal bolt $1\frac{1}{16}$ inches in diameter, is driven 2 inches beyond the muzzle of the gun into the animal's skull. The bolt is either automatically or manually retracted into the stunning instrument for reuse. The penetrating end of the bolt is usually concave, and the cutting edge is sharp. Shape of the bolt seems to be important. It is thought that trapped air in the concave end is driven into brain tissue causing gross tissue destruction.

Powder charge for skull-penetrating mechanical stunners are available in varying loads, depending on species, age, breed, and sex of the animal being stunned. Remington Arms Co., Bridgeport, Conn., recommends a 1.4 gr. charge for medium lambs, 2.5 gr. for average hogs, and 3.0 gr. for heavy cattle. When a compressed-air penetrating stunner* is used, 150 lb. of pressure per square inch is recommended for heavy calves, and 175 to 190 lb. per square inch would produce unconsciousness in heavy steers and bulls.

Application of the penetrator may be in a downward and backward direction from above the eyes in the frontal region with damage being done to the cerebral hemisphere, or it can be placed behind the pole in the occipital region, with the bolt extending downward and forward into the cerebellum.

Nonpenetrating instruments in use are powder-activated only. The striking surface of the bolt is made to resemble the head of the knocker's hammer. As in the case of the penetrator, different powder charges are required depending on species, age, and sex. The following loads have been recommended by the Remington Arms Co.: lambs, 2.0 gr.; heavy cattle, 3.6 gr.; average hog, 3.6 gr.

Penetrating equipment causes unconsciousness by physical brain destruction and a combination of changes in intracranial pressure and acceleration concus-

*Produced by the Thor Power Tool Co., Aurora, Ill.

sion. Nonpenetrating instruments cause unconsciousness by a combination of acceleration concussion and changes in intracranial pressures.

Disturbance of the cardiovascular center in swine, and to some extent in sheep, is caused by both types of mechanical stunning. The result is apparently similar to the condition produced by electrical stunning. Blood pressure rises rapidly and violent convulsive clonic spasms rupture capillaries in muscles and viscera.

As in the case of electrical stunning, immediate reduction or prevention of high blood pressure build-up by early bleeding during the tonic phase is absolutely essential. Failure to stick within 5 seconds after stunning can result in objectionable tissue changes.

Gunshot

The gunshot designation requires that a suitable firearm and ammunition be used for each specie, age, or sex of animal so that immediate unconsciousness is produced. When small-bore firearms are used, a hollow-pointed projectile is necessary.

Unconsciousness is produced by a combination of physical brain destruction and changes in intracranial pressure. In swine,

the reduction or prevention of high blood pressure build-up during the tonic phase is desirable.

Ritual slaughter and handling or preparation of livestock for ritual slaughter are found by law to be humane; therefore, no development or further designation was necessary.

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Dermatitis May Be Due to Neomycin

Allergic cutaneous sensitivity reactions following topical application of neomycin are not common. However, onset of such reactions may be insidious, and the recognition of neomycin sensitivity depends upon a heightened index of suspicion, rather than on appearance of classical signs of acute contact dermatitis. The possibility of neomycin sensitivity should be borne in mind, especially when a patient with eczematous dermatitis does not respond satisfactorily to a neomycin-containing preparation.—*Arch. Dermatol.*, 80, (1959): 455.

Nephrosis Responds to Dextran Therapy

Solutions of dextran suitable for use in nephrosis should be hyperoncotic solutions of 12 per cent concentrations in distilled water. Six per cent solutions of dextran in isotonic sodium chloride, which are suitable for treatment of shock, are not suitable for use in nephrosis.

Intravenous injection of hyperoncotic solutions of dextran causes mobilization of interstitial fluid, which is then excreted by the kidney. Clinical trial has demonstrated that 12 per cent dextran solutions induced diuresis and consequent loss of fluid in some patients. Dextran infusions are often

more effective when used with other edema-reducing agents than when used alone.

For inducing loss of fluid in persons with nephrosis, a 12 per cent solution of dextran in distilled water is infused intravenously, with the dose being adjusted according to the response of the patient. The infusion of 10 to 15 cc./kg. per day for a minimum of 3 to 5 days is suggested. The rate of infusion should be 2 to 4 cc. per minute.

The injection of dextran may produce an increase in bleeding time.—*J.A.M.A.*, 171, (1959): 53.

Radiological Sterilization of Cats?

To determine whether the ovaries of female cats could be rendered permanently inactive by radiologic exposure, German workers exposed the ovaries of 6 cats to fractionated doses varying from 3,000 to 3,900 r. The right ovary was removed after a lapse of 3½ months from the time of irradiation; the left, after 11½ months.

Histologic examination of the ovaries revealed that, under the conditions of the experiment, x-ray treatment was not an effective means of accomplishing lasting sterilization and, therefore, was not a satisfactory substitute for ovarectomy. Moreover, in spite of exact positioning, it seemed impossible to prevent renal lesions from the radiation; there was also irreversible depigmentation of the hair in the irradiated field.—*R. Pobisch and K. Arbeiter in Wein. tierärztl. Monatsschr.*, 46, (1959): 763.

Rabies Vaccination

The mere existence of rabies in canine or wildlife species is sufficient reason for routine pre-exposure vaccination of dogs, preferably with chicken embryo vaccine. The chicken embryo vaccine (LEP Flury stain) for use in dogs should not be used in pups under 3 months of age, nor in other species, such as domestic cats and cattle. For these, the HEP Flury vaccine (chicken embryo origin, cattle vaccine) should be used.

In dogs, vaccination is to protect the individual animal and to prevent dissemination of the disease, whereas in cattle and man, only individual protection is involved. Veterinarians and other high-risk human population groups should receive pre-exposure vaccination.—*Karl Habel at Ann. Meeting of Pennsylvania State VMA, Philadelphia, Oct. 1-3, 1959.*

Nature and Effects of

Radioactive Fallout on the Farm

R. F. REITEMEIER, PH.D.

THE ENERGY of a nuclear explosion is released in the forms of blast, shock, thermal radiation, initial nuclear radiation, and residual nuclear radiation. All except the last are dissipated in a few seconds or minutes, while residual radiation continues to be emitted for years, much of it from radioactive fallout. The simultaneous detonation of a large number of thermonuclear weapons over this nation would result in widespread radioactive contamination of farms and agricultural resources by fallout, with serious consequences to the nation's agriculture.

It is intended here to discuss the nature of fallout, some of its effects on the farm in the event of an emergency involving high levels of contamination, and possible remedial measures.

Origin and Properties of Fallout

When a thermonuclear weapon, equivalent in energy to millions of tons of TNT, is exploded on or near a ground surface, many thousands of tons of earth and construction materials are gathered into the fireball and the column of the resulting mushroom cloud. A fraction of this debris is liquefied and vaporized by the heat of the fireball. When these substances solidify during the subsequent period of cooling, radioactive isotopes are entrapped in the particles. Other radioisotopes become attached to the surfaces of these particles and also to the surfaces of unfused particles. The isotopes consist of fission

products, unfissioned fissionable materials, and neutron-activated isotopes. The fission products are considered to be the most hazardous group.

A portion of the radioactive particles, including the largest ones, return to the ground in a roughly circular area at the detonation site. Other particles are carried downwind in the troposphere and deposited on the ground as local fallout within hours or several days. In this area, the concentration of mass of fallout, the particle size, and radiation intensity generally decrease with increasing distance from the site of detonation. Yet other tropospheric material is deposited in the same latitude band for a period of weeks, primarily as rainout. The remainder enter the stratosphere, where some persist for several years before returning to the troposphere.

Fresh fallout contains a large number of isotopes that emit *beta* rays which are high velocity electrons, or both *beta* and *gamma* rays, which are penetrating electromagnetic emissions. At first, the intensity of the radiation decreases rapidly, because of the disintegration of the many short-lived isotopes. With increasing time, the number of radiosotopes continuously decreases and in stratospheric fallout only relatively few are of significance, including strontium 90 (half-life 28 years) and cesium 137 (half-life 27 years). During the first few months, mixed fission products decay at a rate such that the radiation intensity decreases tenfold for every sevenfold increase in time. For example, the intensity at 7 hours is one tenth of that at 1 hour, and the intensity at 49 hours is one-tenth of that at 7 hours.

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General Effects on Animals

During the deposition of fallout on agricultural land, particles fall on soil,

crops, and animals. Immediately following heavy deposition of fresh fallout, serious radiation exposure-hazards to animals include external *gamma* radiation, internal irradiation of the gastrointestinal tract by ingested *beta* and *gamma* ray emitters, and irradiation of the thyroid gland by radioiodine isotopes concentrated there. Particles lodged on the skin may also cause *beta* ray skin burns.

The whole body *gamma* radiation dose which will be lethal within 30 days to half of exposed livestock is about 500 roentgens(r). The sensitivity of different species of animals to whole body radiation does differ to a moderate extent, however. Median lethal values for a 24-hour radiation exposure for cattle, sheep, swine, and poultry are 600, 520, 460, and 800, respectively. The radiation dose to which animals would be exposed can be reduced by shelter which provides considerable distance or an appreciable mass of material between the animals and the fallout. It is estimated, for example, that shelter in a two-story basement-type barn, with a loft-filled with hay, would reduce the exposure to about one fifth of that of unsheltered animals. For a shelter to be maximally effective, the animals should be placed there before the arrival of fallout. It is recommended, of course, that people do not expose themselves to fallout in order to move animals to shelters or to provide other animal care.

Through the ingestion of fission products in fallout, animals may be affected not only pathologically, but their tissues and products become radioactively contaminated. For example, radioiodine and radiostrontium isotopes are secreted into milk. In the period immediately following the deposition of fresh fallout, the critical contaminant of milk is radioiodine, due to the radiosensitivity of thyroid glands of children. When the main source of contamination is stratospheric fallout or relatively old local or tropospheric fallout, strontium 90 is the critical isotope in milk. Strontium 90, similarly to calcium, accumulates in human and animal bones, where it becomes a potential cause of bone tumors and leukemia. *Gamma*-emitting cesium 137, however, becomes distributed generally throughout the soft tissues, including the muscular tissues which are commonly used as meat. It is a potential source of genetic damage. In areas that

have been affected by local fallout, therefore, animals should be fed uncontaminated feed and water insofar as possible, instead of forage crops which have been contaminated in the field.

Effects on Crops and Soils

Fallout may be deposited on soil and vegetation as dry particles or as rainout. Most of the fine particles which are deposited as delayed tropospheric or stratospheric fallout are carried to earth by rain. On the other hand, it is usually expected that most of the local fallout will be deposited in dry particles. In the latter case, the fractions which remain on the vegetation will increase directly as the ground cover density and the adhesivity of the plant surfaces and oppositely as the size of the particles.

In zones of local fallout, having *gamma* radiation intensity levels ranging upward from 1r per hour at 1 hour after detonation, the existing crops should not be used for animal or human food if other food supplies are available. This is particularly true for crops used in the production of milk, because of the relatively great hazard to children from the ingestion of radioiodine isotopes in milk, and for leafy vegetables, which are efficient collectors of fallout. Instead, the contaminated crops should be removed from the land as completely as practical and discarded. This would partially decontaminate the land. In zones of relatively low contamination, this might be the only feasible land decontamination measure, and in heavy fallout zones it would reduce the efficiency of soil decontamination otherwise needed. The raking and disposal of contaminated crop residues and mulches would also help for the same reasons. However, harvesting operations for this purpose should not be attempted until radiation hazards to the workers are acceptable under emergency standards.

In addition to external contamination, plants may be contaminated internally by the absorption of fallout isotopes into the foliage and other above-ground parts, by stem-base absorption, and by uptake from soil by roots. Iodine, strontium, and cesium are absorbed into leaves to varying extents, but of the 3 elements, only cesium

appears to be translocated at an appreciable rate to other plant parts. Long-established grass pastures develop a root mat which lies just above the soil surface. There is evidence that the roots and stem bases occurring there can absorb strontium 90 which has been washed down from the foliage. When the predominant mechanism of plant uptake is foliar absorption or stem-base absorption, the concentration of the isotope in the plant depends mainly on the more recent deposition rather than the cumulative deposition in the soil.

Strontium 90, like calcium, accumulates in human and animal bones, where it becomes a potential cause of bone tumors and leukemia; cesium 137 lodges in soft tissues and is a potential source of genetic damage.

The fallout reaching the soil surface is subject to erosion similar to that of soil particles. Following a heavy deposition of fallout, lower-lying agricultural areas which accumulate eroded soil material should be monitored at intervals for a possible concentration of fallout isotopes.

The uptake from soil of short-lived isotopes, for example radioiodine, is of little significance compared to direct atmospheric contamination of the plants. Most of the fission products occur as cations. During their entry into and passage through soils, they become attached, by differing bond strengths, to the surfaces of soil particles, by adsorption, chemical precipitation, or replacement of exchangeable cations. This restricts their movement through the soil and their uptake by crops.

The leaching of the longer-lived isotopes through soil under the influence of rainfall is too slow for it to be considered an effective natural remedial measure. However, strontium, although it does move through soils very slowly, is leached at a rate one or two orders of magnitude greater than that for cesium. Radiostrontium is held by the colloidal cation-exchange complex of the soil primarily in a readily exchangeable form, while radiocesium is predominantly fixed in a nonexchangeable

state. Other channels of movement of isotopes are soil cracks, worm casts, and animal burrows.

Relative to strontium 90 and strontium 89 (half-life 54 days), the uptake from soils of other longer-lived fission products produced in moderate abundance is very low, generally less by one or more orders of magnitude. Even strontium uptake by a single crop generally is only about 1 per cent of the soil content.

The behavior of strontium in soils, plants, and soil-plant relationships is similar to that of its chemically related nutrient element, calcium. Those plants or plant parts which have high calcium contents will have relatively high contents of soil-derived strontium. For instance, high calcium legume crops may contain three times as much strontium as grass crops grown on the same soil. However, since the radiostrontium:calcium ratio of the crops would be the same, and the calcium content of milk is constant at about 1 Gm. per liter, milk produced from both types of crops would have the same radiostrontium content. The substitution of foods of low calcium and strontium content for foods of high content is of little or no benefit unless the diet is supplemented by an uncontaminated source of calcium.

Although entire plants exhibit only slight discrimination between strontium and calcium during uptake from uniform soil, various parts of plants discriminate significantly between the 2 elements. Strontium is preferentially retained by fibrous roots, while calcium is preferentially accumulated by seeds and fruits. The strontium:calcium ratio of plants grown in the field will depend on the location of the strontium in the soil, the pattern of distribution of available calcium in the root zone, and the active root habit of the crop. When the radiostrontium is at or near the soil surface, deep-rooted crops, such as alfalfa grown on a soil having high available calcium throughout the root zone, will contain but little radiostrontium and have a low strontium:calcium ratio.

Remedial Measures for Soils

Increases in available calcium of acid soils by lime applications, and of alkaline soils by gypsum applications, sometimes

reduce the radiostrontium content of the crop or the radiostrontium:calcium ratio. The maximal effect to be expected from such treatments, however, is a reduction by a factor of 3. Adding lime beyond the cation exchange capacity is of no value for this purpose and, additionally, would in some soils create imbalances in the supply of nutrient elements. Greater ranges in available calcium levels occur among soil types naturally. At the same cumulative strontium 90 deposition per square mile, the strontium hazard will be roughly proportional inversely to the level of exchangeable calcium in the soil.

Fertilizers or organic matter also may reduce the strontium 90 content of crops. However, when this occurs, the calcium content also will be reduced. Therefore, the consumption of such crops will not result in a lower retention of strontium 90 in the body unless the diet is supplemented by uncontaminated calcium.

Experiments have indicated that deep plowing of soils having fallout on the surface may reduce the uptake of strontium 90 by shallow rooted crops, such as many grasses, to about one third. The surface application of lime or gypsum following the plowing will be of additional benefit if the soil is deficient in calcium.

It has been shown that strontium can be leached downward through soils by acids and calcium salts in the leaching water. However, large quantities of water and leaching agents would be required. Plant

nutrients also would be leached from the root zone and would have to be replaced. The acid treatment might also damage the soil structure severely.

Following a widespread but uneven contamination of land with longer-lived isotopes, geographical shifting of crop production might be a remedial measure, insofar as climate and soil characteristics permit. Nonfood crops such as cotton and flax, and even crops used for the production of sugar, oil, and meat could be grown on heavily contaminated land. Milk and vegetables should be produced only on the land having low levels of contamination. Land heavily contaminated by strontium 90, but which must be used for production of milk or vegetables, should be decontaminated by removal of the surface soils. Scraping off 2 inches of soil having a smooth surface, with a road grader, may remove over 99 per cent of the fallout. For rough plowed surfaces, the removal by this treatment may be only 60 per cent, but can be increased by scraping off a greater depth of soil. The disposal of the removed contaminated soil might have to be in pits in the center of fields or regularly spaced ditches across the fields.

In conclusion, it is emphasized that normal cultivation or deep plowing of heavily contaminated land precludes the possibility of physical removal of the fallout. Consequently, it may be impossible to use such cultivated land for production of milk and vegetables for many years.

Eye Cancer in Herefords

Herefords in tropical areas of Australia are peculiarly susceptible to eye cancer. A highly significant negative association was found between the incidence of precursor lesions of lids and the degree of lid pigmentation. A significant association was found between increasing incidence of lesions of the eyeball and decreasing lid pigmentation.

Eye cancer is unusual in cattle less than 4 years old. Susceptibility to eye cancer reaches a peak at about 8 years of age and may then decline. Lid pigmentation was found to be strongly heritable. It was recommended that attempts to reduce the incidence of eye cancer be based on selection for a high degree of lid pigmentation.—*Austral. Vet. J.*, 35, (1959): 474.

Editorial

Who Runs the AVMA?

From its earliest days, the question of who runs the AVMA and who forms its policies and programs has been kicked around by nearly everyone. By "nearly everyone" is meant not only the members of the profession in general and Association members in particular but, occasion-

A report prepared by Dr. John G. Hardenbergh, who served the AVMA as Executive Secretary from Jan. 1, 1941, to Aug. 31, 1958, then as General Consultant until Dec. 31, 1960, when he retired.

ally, persons outside the profession who apparently are possessed of wisdom and foresight not granted to those within it. So, all sorts of viewpoints have been expressed on the question of what was "wrong" with the Association, its alleged neglect of practitioner interests, and what should be done to correct the situation.

Eastern Members Favored?

The usual approach has been the formation of another national veterinary association. There have been several such undertakings since 1863 when the AVMA was established. Thus, in the late 1870's and early 1880's, almost before its predecessor, the newborn United States Veterinary Medical Association, had time to get on its feet, to say nothing of learning to walk, some thought that its leaders were concerned only with the interests of veterinarians on the eastern seaboard and neglected the segments of the profession west of there. Even though the eastern members were almost entirely practitioners, the dissidents claimed that their interests were

given scant attention and proposed the organization of a new association. This was the first such movement.

The plan was to have component state associations (as the AVMA later did), and many of the older state veterinary medical societies were organized during the middle '80's. This was a definite longterm gain for organized veterinary medicine; even though the new national association soon folded up, the state associations became, in due time, strong components of the AVMA.

Another Protest Organization

The second national association to be organized in protest against the U.S.V.M.A. also began in the 1880's and was openly antagonistic to it. The reason: the U.S.V.M.A. was dominated, and its policies set, by men connected with the two major veterinary schools then operating in New York City. It was claimed that these men had no interest in practitioners and no concern for their welfare—a surprising attitude, if true, for the school men to take if they were to encourage student enrollment at their institutions. The new association held 10 annual meetings, the first in 1886, but made no headway and expired in 1896.

Although there was talk at times thereafter of the need for a "practitioners' association," nothing was undertaken until 1920 when a national association of veterinary practitioners was proposed by a group attending the AVMA convention in Columbus. Some 200 veterinarians indicated interest in membership. Their protest was that a practitioner had small chance of being elected president of the AVMA and that it was dominated by the schools. This third proposal of a national veterinary association in competition with the AVMA got no further than the discussion stage.

The Birth of AAHA

The next (fourth) movement took place in the early 1930's and was aimed at providing an organization to represent a specialty group—small animal practitioners. It was destined to be highly successful in its objectives—to furnish a better forum and more time for the presentation and discus-

sion of papers and problems in the field of pet practice than the AVMA Section on Small Animals could provide; to work with that Section in improving its convention program; to improve the veterinary services and facilities available for hospitalization of small animals; to establish and maintain high standards for these services and facilities; to protect and promote the interests of veterinarians engaged in small animal practice and in hospitalizing them.

This association took form in 1933 as the American Animal Hospital Association. Its member hospitals are selected according to specific standards of construction, operation, etc. The association has grown steadily in membership, influence, and affluence; it conducts professional and public relations programs and research activities of great merit; and in no sense is dissident or competitive with the AVMA. Rather, it is closely working and supportive of AVMA programs with reference to small animal practice and hospital relationships.

American Foundation of Veterinary Therapy

The fifth movement to form an association dedicated to practitioner interests took place in 1940 when a group of veterinarians in the Kansas City area sponsored an organization first designated as the American Foundation of Veterinary Therapy. Later, it was named the American Society of Veterinary Therapy but was commonly referred to as "The Practitioners' Association." One of its prime movers and officers during its brief existence was a former AVMA president, the late Dr. J. C. Flynn.

[It is interesting and significant that this new association was organized in the same area where, for many years, the Missouri Valley Veterinary Association, almost exclusively a practitioners' group, flourished. At one time, the M.V.A. claimed to have more dues-paying members than the AVMA. One M.V.A. president urged that it extend its jurisdiction to include the entire United States, make an appropriate change in name, and become a national organization for practitioners exclusively. But the M.V.A. members were proud of their association's identity and prestige and would have none of it. Then, for various reasons, the association went into a rapid decline and ceased to exist in about 1925.]

The American Society for Veterinary Therapy was launched with considerable promise and support. It planned to hold only business sessions, these to convene at the same time and place as AVMA conventions. Such sessions were held in 1941 and 1942. Dr. Flynn served as secretary and carried on the paper and record work of A.S.V.T. until World War II came along, when he had to resume active management of his small animal hospitals which had been leased to younger veterinarians. The new association then dropped from sight.

At the time the American Society of Veterinary Therapy or "Practitioners' Association" was being formed, the late Dr. D. M. Campbell, then editor of *Veterinary Medicine*, an active worker in the AVMA for many years and a keen student of veterinary medical and professional affairs, had the following to say about the so-called plight of veterinary practitioners and their status with respect to the AVMA (the italics are ours):

Sixty-five per cent of the veterinarians in the United States are engaged in practice and an association devoted exclusively to their interests can doubtless accomplish much if it works in co-operation with the national and state associations. While each branch of the veterinary profession has its special interests and the practitioner branch is no exception, the interests of each branch in the welfare of the profession *as a whole* is of greater moment to it than its own particular interests. *No branch of the profession can stand alone.*

Later (1941) during the first year of A.S.V.T.'s operation, Dr. Campbell said:

The reasons for the neglect of clinical veterinary medicine [by the AVMA] are numerous but the principal one is lack of leadership due, in the main, to geographic obstacles. Until recent years, the organization [of the Association] placed its control wholly in the hands of those who attended its annual meetings and almost as effectively in the hands of those who attended these meetings year after year over a long period. *This included precious few general practitioners.*

The present organization of the AVMA [House of Representatives, etc.] was designed to place the control of the organization largely in the membership at large. Whether or not he attends the annual meetings, he can have a voice in the selection of the officers and, indirectly, a voice in the policies of the AVMA. Strangely, practitioners have not availed themselves of this opportunity which the Association has rendered them. A little investigation of votes cast for Executive Board members revealed *fewer than one in seven cast by practitioners in the nominating balloting and always*

less than a majority in the election itself. Since the number of general practitioners in the AVMA House of Representatives is small, one may assume that practitioners have been equally indifferent to the selection of this, the legislative body of the AVMA . . . [Not so—see following data.]

The problem [of the Practitioners' Association] is one of educating the private practitioner of veterinary medicine to take a greater interest and give more active support to organized veterinary medicine, through which all progress and improvement in the profession is achieved

It is preposterous to say, as has been said, that the AVMA is antagonistic to the practitioner. The AVMA doesn't know the practitioners' problems because he hasn't told it what these problems are. It hasn't done much of anything for him because he has not said what he wants done. It has seldom elected him to a place on its Executive Board because it is not often that he has taken the trouble to vote.

With the foregoing as background, let's look at the record as to who has been elected over the years as president of the AVMA and to its Executive Board; also, who has served in its House of Representatives—now House of Delegates—in terms of their fields of professional activity.

A study was made to determine the extent to which the several segments of the profession have had a voice and have actively participated in the affairs of the Association. The data presented were obtained by going back to the beginning of the organization and noting the professional activity or principal field of interest of the men who have been elected to office, have served on the Executive Board or in the House of Delegates, and who have been employed in a professional capacity on the headquarters staff.

To simplify the analysis, the diverse fields of professional veterinary endeavor were grouped into four categories as follows:

Practice: all kinds (general, mixed and special, including bovine, equine, poultry, small animal, sheep, and swine).

Teaching and Research: includes teaching only, research only, and teaching and research combined.

Government Service: all kinds except military, includes federal and dominion, state and provincial, county, and municipal.

Other Classifications: includes military services (Army and Air Force), commercial, and miscellaneous.

In order to orient the data to be presented on these four categories in relation to the over-all breakdown of professional

activities of veterinarians in the United States and Canada, following are figures based on the 1958 "AVMA Directory" which listed nearly 21,000 veterinarians:

Practice—all kinds	65.31 per cent
Teaching and/or research	4.68 per cent
Government service	13.94 per cent
Other classifications	16.07 per cent
	100.00 per cent

With these figures in mind, it will be apparent whether there has been "proportional representation" of the four groups in the various elective and other offices of those who may be said to "run" the Association and its affairs.

Professional Activities of AVMA Presidents — 1863-1960

During the 97 years of the Association's existence, 80 individuals have been elected president; 12 of them served for more than one year or term. Of these 80 presidents:

34 (42.5%)	were in full or part-time practice
28 (35.0%)	were in teaching and/or research
13 (16.2%)	were in government service
5 (6.3%)	were in other professional work

Of the last 20 presidents, 5 (25%) have been practitioners; 8 (40%) have been in teaching and/or research; 3 (15%) in government service, and 4 (20%) in other activities (2 commercial, 2 military service).

Professional Activities of Executive Board Members

Since the Executive Board was first established in 1916, there have been 83 individuals elected to it from the various districts. Of these:

30 (36.1%)	have been in practice
30 (36.1%)	have been in teaching and/or research
18 (21.7%)	have been in government service
5 (6.0%)	have been in other professional work

During the same period, 20 individuals have served as chairman of the Board. Of these:

7 (35%)	have been in practice
8 (40%)	have been in teaching and/or research
3 (15%)	have been in government service
2 (10%)	have been in other professional work

In the nomination and election of Executive Board members, the records show that a rather small number of AVMA members usually exercise their voting privilege and so fail in the opportunity to say who shall run for and be elected to this important administrative body. In 22 Board elections from 1951 to 1958, inclusive, an average of *only 21 per cent* of the members in the various districts took part in the nominating primaries; slightly more than half (56%) cast their ballots in the final elections in those districts.

Professional Activities of Members of the House of Delegates

The House was first constituted in 1934. In the 26 years from 1934 to 1959, inclusive, the proportion of delegates in the four categories of professional activity has been as follows:

Practice—all kinds	58.2 per cent
Teaching and/or research	15.7 per cent
Government Service	20.3 per cent
Other professional work	5.8 per cent

With respect to practitioner representation in the House of Delegates, the lowest proportion was 42 per cent in 1935; the highest was 68 per cent in 1957. Since 1953, the proportion has been not less than 65 per cent.

Professional Backgrounds of AVMA Executive Staff and Editors

In the early days of the Association, there was no headquarters office as such. Not until 1922 was it decided to employ a full-time secretary-editor and to employ a veterinarian to fill the dual position. Since 1863, 22 veterinarians have served as secretary, secretary-editor, or executive secretary. Their professional backgrounds, in general, have been as follows:

Practice	22.7 per cent	}
Practice plus part-time teaching	22.7 per cent	
Teaching and/or research ...	31.8 per cent	
Other (commercial, etc.)	22.7 per cent	

Since 1863, when the Association acquired the *American Veterinary Review* and made it the JOURNAL of the AVMA, 9 veterinarians have served as part-time or full-time editors. Their professional backgrounds:

Practice	44.4 per cent
Teaching and/or research	33.3 per cent
Other professional work	22.2 per cent

Combining the figures on the professional activities and backgrounds of the men who have served over the years as Association presidents, Executive Board members, House delegates and headquarters staff members, the following is the picture:

Practice	40 per cent
Teaching and/or research	30 per cent
Government service	20 per cent
Other professional work	10 per cent
100 per cent	

What Is the Situation Today?

As of 1959-1960, the 19 elective officers, Executive Board members, and professional staff members come from the following fields of work:

Practice	10 (52.6%)
Teaching and research	6 (31.6%)
Other	3 (15.8%)

In the House of Delegates, the situation currently shows the following breakdown:

Practice	39 (65.0%)
Teaching and research	8 (13.3%)
Government service	8 (13.3%)
Other Work	5 (8.3%)

The foregoing analysis is not intended to prove or disprove anything; the reader may interpret the data as he sees fit. However, it does seem clear that the democratic processes which govern the AVMA as an organization have worked exceedingly well in that all "groups" within the membership have been and are represented and have a voice in "running" their Association rather surprisingly in proportion to their numbers and in conformity with their respective spheres and degrees of influence as segments of the profession.

from the *Research Journal*

Oocyst Production of *Eimeria maxima*

Comparative studies of the oocystic sporulation of *Eimeria maxima*, *Eimeria fauieri*, *Eimeria perforans*, *Eimeria media*, and *Eimeria magna* were carried out under simulated Egyptian summer conditions at a temperature of 30 C. \pm 1 degree.

In *E. maxima*, no zygotic division occurred before 48 hours, sporocyst formation was reached in 79 hours, and complete sporulation appeared to have been reached in approximately 96 hours. The oocysts of *E. fauieri* of sheep and *E. perforans* of rabbits had comparatively rapid development, with complete sporulation being clearly evident in most cultures by 48 hours. No signs of activity were seen in either *E. media* or *E. magna* oocysts before 48 hours, the former

reaching maturity by the end of 72 hours and the latter by 96 or 108 hours.

Attention was given to the cycle of oocystic production, represented by *E. maxima*. The incubation period was demonstrated to be approximately 6 days; the duration of the cycle was calculated to range from 3 to 8 days and was interrupted by the regular occurrence of a negative period of 1 to 6 days.—[M. H. Haiba and M. K. Selim: *A Study of the Oocystic Sporulation of Some Avian and Mammalian Eimeria Species Under Simulated Egyptian Summer Conditions, with Special Reference to the Cycle of Oocyst Production of Eimeria maxima*. Am. J. Vet. Res., 20, (Nov., 1959): 954-956.]

Nasal Trichomonads on Swine Tissue Cultures

Serial passage cell cultures of swine kidney through 105, swine nasal mucosa through 87, swine lung through 65, and swine endothelium through 22 transfers are described. In addition, techniques for preparation of primary cultures from lungs and kidneys of 1-day to 8-week-old pigs are described. The effects of hog cholera virus, pseudorabies virus, swine influenza virus, Newcastle disease virus, eastern equine

encephalomyelitis virus, western equine encephalomyelitis, virus pneumonia of pigs, swine nasal trichomonads, and *Mycoplasma hyorhinis* on these cell cultures are reported.—[William P. Switzer: *Action of Certain Viruses, Mycoplasma Hyorhinis, and Nasal Trichomonads on Swine Tissue Cultures*.] Am. J. Vet. Res., 20, (Nov., 1959): 1010-1019.

A Virus of Ovine Abortion

A virus considered to be in the psittacosis-lymphogranuloma venereum group was isolated from sheep in Montana which showed signs closely resembling those of enzootic abortion of ewes as described by Stamp. This agent exhibited an affinity for yolk sac tissue

of embryonating eggs, mouse lungs, and placental tissue of ewes and guinea pigs. Moderate doses produced little or no clinical disease in mice by the intraperitoneal, intracerebral, or intravenous route, but were lethal on intranasal administration.

Intraperitoneal inoculation of moderate

doses into guinea pigs produced a typical clinical and pathologic syndrome which resulted in recovery and resistance to reinfection.

Cross immunity between this virus and the Stamp virus was demonstrated in guinea pigs. As its characteristics corresponded closely to those observed in this laboratory or reported by others for the virus of enzootic abortion of ewes, it was identified as a strain of that virus.

Until further information is available, however, its relationship to several very similar viruses of the psittacosis-lymphogranuloma venereum group is uncertain.—[H. D. Parker: *A Virus of Ovine Abortion—Isolation from Sheep in the United States and Characterization of the Agent*. Am. J. Vet. Res., 21, (March, 1960): 243-250.]

Immunity to Bovine Cutaneous Papillomatosis

Test calves were subjected to a number of vaccination treatments intended to immunize them against subsequent challenge with active bovine papillomatosis materials. A single injection with a formalinized suspension of bovine wart material produced a significant degree of immunity. A single actively growing wart induced immunity to challenge with the bovine papilloma agent in nearly two thirds of the calves. Nearly one third had a partial degree of immunity, and a few remained fully susceptible.

The bovine papilloma agent propagated in chicken embryos had a low degree of infectivity and no immunizing ability for calves.

It appeared from a few trials that there was a higher concentration of agent in warts 120 days old than in a wart 60 days old. The papilloma agent was found in both the epithelia and the connective tissues of bovine warts.

The connective tissue from the corium of the bovine wart and the connective tissue of a "sarcoma" caused by bovine wart virus in the skin of a horse contained virus capable of producing warts in calves. Calves given the infected connective tissue material remained susceptible to the bovine papilloma agent.—[C. Olson, D. Segre, and L. V. Skidmore: *Further Observations on Immunity to Bovine Cutaneous Papillomatosis*. Am. J. Vet. Res., 21, (March, 1960): 233-242.]

Porcine Enteroviruses

Five antigenically different viruses were isolated from the feces of swine by the use of tissue culture methods utilizing porcine kidney cells. Four of these viruses produced distinctly different types of plaques. These viruses were isolated from both healthy swine and those showing diarrhea.

Although no disease has yet been definitely associated with any of these viruses, their

pathogenic potentialities should be considered and probably exist. It is proposed that these viruses, temporarily at least, be called ECP (enteric cytopathogenic porcine orphan) viruses, followed by a number indicating different antigenic types.—[E. H. Bohl, K. V. Singh, B. B. Hancock, and L. Kasza: *Studies on Five Porcine Enteroviruses*. Am. J. Vet. Res., 21, (Jan., 1960): 99-103.]

Lipoprotein Pattern in Cattle

Total cholesterol levels, and paper electrophoretic lipoprotein patterns in the serums of normal cattle of both sexes, and belonging to different age groups, were investigated.

Total cholesterol values, and the α lipoprotein value of the heifers exceeded those of the bull calves; castrated bull calves of the same age showed intermediate values.

The corresponding values for pregnant and lactating cows were significantly higher, as compared with groups of bull calves, castrated bull calves, and heifers, both with regard to total serum cholesterol and to α lipoproteins.—[K. Perk and K. Lobl: *Serum Cholesterol and Paper Electrophoretic Lipoprotein Pattern in Cattle*. Am. J. Vet. Res., 20, (Nov., 1959): 989-991.]

Spontaneous Tumors in Primates

Two cases of spontaneous neoplasms in subhuman primates are reported. One was an undifferentiated carcinoma in a female cynomolgus monkey, the only neoplasm encountered in the authors' series of more than 100,000 monkeys. The other, a malignant lymphoma from a male gibbon in a zoo, was demonstrated in several of the organs submitted for routine histologic examination.

There appear to be no previous reports of these tumors in simians. Certain factors need to be considered in drawing conclusions about the apparent resistance of subhuman primates to neoplasms. Only a limited number necropsied reached an age com-

parable to that at which the highest incidence of cancer is encountered in man. It also is quite probable that some tumors have been overlooked in routine necropsies. However, the fact that experimental attempts to produce cancer in monkeys have been mostly unsuccessful supports the view that even optimal conditions for tumor development and diagnosis would not appreciably modify the apparently low incidence indicated by currently available data.—[J. W. Newberne and V. B. Robinson: *Spontaneous Tumors in Primates—A Report of Two Cases with Notes on the Apparent Low Incidence of Neoplasms in Subhuman Primates*. Am. J. Vet. Res., 21, (Jan., 1960): 150-155.]

Growth of Foot-and-Mouth Disease Virus

Suspended cultures were prepared from bovine kidney tissue in which minced tissue, trypsin-dispersed cells, and trypsin-dispersed cells from cultures first grown on glass were maintained in a viable state. Such suspensions were infected with foot-and-mouth disease virus, type A, strain 119, and high titers were attained. Suspensions of minced tissue, trypsin-dispersed cells, and trypsin-dispersed cells first grown on glass produced maximum titers of $10^{6.2}$, $10^{7.3}$, and 10^8 plaque-forming units per milliliter, respectively, in 40-ml. cultures.

A yield of $10^{7.2}$ plaque-forming units per milliliter from a 10-liter suspended culture of trypsin-dispersed cells indicates the feasibility of the production of large volumes of high titered virus by the suspension method.

The saving in materials, time, and labor by the suspension method over that of the monolayer method is discussed.—[R. E. Patty, H. L. Bachrach, and W. R. Hess: *Growth of Foot-and-Mouth Diseases Virus in Bovine Kidney Cell Suspensions*. Am. J. Vet. Res., 21, (Jan., 1960): 144-149.]

New Books

Vertebrates of the United States

This single volume work deals with all vertebrates in the United States and the marine birds and mammals of adjacent waters. It contains a check list of freshwater species of fishes of the United States.

Chordate characters, vertebrate history and characters, principals of classification and nomenclature, and vertebrate distribution are thoroughly but simply treated.

Five authors have contributed to the vol-

ume. Each is a recognized authority on the particular part of the book prepared by him. It is good to see such a text so carefully prepared by such authorities.

Veterinarians can make good use of this text as a reference book and to broaden their knowledge of vertebrates.—[*Vertebrates of the United States*. By W. Frank Blair et al. 819 pages. McGraw-Hill Book Co., Inc., 330 W. 42nd St., New York 36, N. Y. 1957. Price \$12.00.]—LEONARD J. GOSS.

A Textbook of Surgical Physiology

Because physiology for the most part is an applied science, it changes with time. Because it is difficult to teach, and to learn, any text that beguiles the reader into using it is to be commended. Medical textbooks usually bludgeon the reader with facts. For example, a reader who can, without fatigue, work through ten pages of a standard text on physiology is probably not absorbing what he is reading. We are giving our students too much to learn, and they lose their

sense of proportion with respect to the subject matter.

This concise, accurate, readable book should be of value to anyone preparing for an examination or improving his knowledge. Although intended for surgeons, it actually covers most of the ground also required by physicians.—[*A Textbook of Surgical Physiology*. By R. Ainslie Jamieson and Andrew W. Kay. 623 pages; illustrated. Williams & Wilkins Co., Mt. Royal Ave., Baltimore 2, Md. 1959. Price \$11.00.]—J. ARCHIBALD.

Neurologic Examination of the Dog

This book remains the only book in English and probably the only one of its kind in veterinary medicine. It will be valuable to both student and practitioner. The study of actual cases make up the backbone of the book. Basic techniques in neurodiagnosis are applied and evaluated. The pathology of each case is presented so that little is left for speculation.

However, the use of anatomical pathways and functional concept diagrams would help symptom and lesion correlation. Too, there is a need for a more detailed description of both location and extent of lesions.

The book faces a major task since little

information is available on the anatomy and physiology of the nervous system in this animal and others considered in veterinary medicine. It is a sad commentary that curricula of only a few veterinary schools give a background adequate enough to properly utilize its contents. It is hoped that the author, in future revisions, need not aim at simplification as one of his goals to entice the group for which it is written.—[*Neurologic Examination of the Dog*. John T. McGrath, V.M.D. 2nd ed. 263 pages; 183 illustrations. Lea & Febiger Co., 600 S. Washington Square, Philadelphia. 1960. Price \$7.00.]—CALVIN C. TURBES.

Diseases of Domestic Animals in New Zealand

The 240-page book was prepared by a technical committee of the New Zealand Veterinary Association, Inc. It deals with the important diseases of domestic animals as they occur in New Zealand. The presentation for each disease follows a standard outline form similar to that followed by the American Public Health Association book on the control of communicable diseases. The subject matter is divided into categories and is well indexed for quick reference. The primary aim of the committee was to provide a book that contained maximum information in the fewest possible words. The objective was accomplished but to an

extreme, the contents being too brief. Since numerous pages are only partly used, valuable additional information pertaining to such things as methods of control could have been included without increasing the size of the book. The authors do deserve commendation for their efforts to provide an informative, ready reference text.—[*Diseases of Domestic Animals in New Zealand. Prepared by the Technical Committee, New Zealand Veterinary Association Inc. 240 pages. Editorial Service Ltd., Box 2721, Wellington, N.Z. 1958. Price \$4.90.*]—JOHN H. HELWIG.

Microbial Variation

The Russian work reported in this book was completed between 1948 and, probably, 1952. The English edition is new; however, the original Russian edition is probably several years old, although the date was not designated in the book.

The experiments on microbial variation were carried out at the Gamaleia Institute of Epidemiology and Microbiology, after the conference of the Lenin All-Union Academy of Agricultural sciences was held in Moscow July 31 to Aug. 7, 1948. The purpose of the book, as stated by V. D. Timakov who edited the compilation, was to attempt to explain the principles of variation and species formation in microorganisms, and to find out whether directed variations can be made to occur, in order to obtain avirulent strains having immunizing ability.

The first chapter, prepared by the editor, is concerned with microbial variation and the delineation of species. He points out that the Soviet workers are adherents of "the materialistic view and consider that microorganisms change their nature and their characters in accordance with the conditions under which they exist, determined by factors of the external environment."

The remaining chapters of the book, prepared by various workers at the Gamaleia Institute, describe the variation induced in bacteria by experimental methods. Most of

the studies involved enteric bacteria and the principal techniques were: (1) the cultivation of one species or strain on a medium containing killed organisms of another species or strain, and (2) growth of bacteria in the presence of antibiotics.

The results and observations of the various authors contribute to the available data on bacterial variation. Although there are no entirely different or new approaches, the results do substantiate the observations of others in this field of work.

Interpretation of the results is obviously influenced by Lamarck and Lysenko. Today, the data in this book would be interpreted by microbial geneticists on the basis of the genetic components of the bacteria or bacteriophage, the compatibility of mating types, and bacteriophage as a carrier of genetic material.

For those who may be interested in what the Russian microbiologists were doing and thinking some five or ten years ago, this book may have some value. Anyone who reads the book hoping to gain new ideas and techniques in the field of microbial genetics will be disappointed.—[*Microbial Variation. Edited by V. D. Timakov; translated by G. H. Beale. 202 pages; illustrated. Pergamon Press. 122 E. 55th St., New York 22, N. Y. 1959. Price \$6.50.*]—L. C. FERGUSON.



News



Left to right—Mr. R. E. Parrish, chairman of LCI's executive committee; and Dr. H. E. Kingman, Jr., AVMA executive secretary.

Livestock Conservation, Inc., Annual Meeting

Group Aims to Work on National Basis

Meat packers, government officials, shipping representatives, and veterinarians attended the 1960 annual meeting of Livestock Conservation, Inc., held at the Congress Hotel in Chicago, February 3-4.

Main accomplishment was to realign the organizational structure so that problems of livestock mishandling, disease, and parasites could be attacked on a national basis.

Participants on the program included: Mr. Roger Fleming, secretary-treasurer and director of the Washington, D.C., office of the American Farm Bureau Federation—conserving our livestock resources; Dr. J. E. Rickenbacker, agricultural economist, FCS, USDA, Washington, D.C.—safe handling—pathway to profits; Dr. H. E. Kingman, Jr., executive secretary to the AVMA, Chicago—reducing livestock losses from parasites and disease; Mr. R. Harvey Dastrup, executive director, Livestock Conservation, Inc., Chicago, Ill.—opportunities for reducing livestock losses through LCI.

An entire afternoon of the meeting was devoted to separate sessions of the organization's four standing committees. Directors and committees are: Dr. S. H. McNutt, veterinary science department, University of Wisconsin—brucellosis; Mr. Keith Myers, executive secretary, National Swine Growers Council, Grundy Center, Iowa—hog cholera; Dr. J. W. Cunkelman, chief veterinarian, Swift & Company, Chicago—cattle grub; and Mr. John Macfarlane, field director, New England Livestock Conservation, Inc., Boston, Mass.—safe handling.

Results of Hog Committee Session

An outgrowth of the national hog cholera committee was the passage of a resolution to help eliminate this costly disease problem. It read:

The national hog cholera committee reaffirms its support of the program for the eradication of hog cholera as outlined in the 1959 report and recommendations of the national hog cholera committee. To give this program leadership, we wish to recommend that the United States Department of Agriculture call regional or district meetings of state swine industry leaders and to prepare the necessary material for the holding of such meetings that will encourage the states to move forward with the program outlined in the 1959 recom-



Some of the attendees at LCI's brucellosis committee meeting are, left to right—Drs. James H. Steele, Chester A. Manthei, R. W. Smith, S. H. McNutt, and Mr. Dick Burleson.

mendations. We further recommend that LCI give wide-spread distribution to the pamphlet prepared by the USLSA, entitled "What You Should Know About Hog Cholera."

Dr. Kingman Elected LCI President

Dr. H. E. Kingman, Jr., of Chicago, executive-secretary of the AVMA, was elected

president of LCI for 1960. Other officers elected were: Mr. John C. Macfarlane, New England Livestock Conservation, Inc., Boston, Mass., first vice-president; Mr. R. M. Dall, Armour & Co., Chicago, second vice-president; Mr. P. Zillman, American Meat Institute, Chicago, secretary-treasurer.

Hog Cholera Meeting—First in a Series

Invitations were sent to nineteen individual groups. Representing the AVMA at this session were: Drs. W. A. Hagan, director of the National Animal Disease Laboratory, Ames, Iowa, and a member of the AVMA's Research Council; J. A. Henderson,

member of the AVMA Council on Veterinary Service, Ankeny, Iowa; and H. L. Marsh, a member of the AVMA's Council on Education, Princeton, Ill.

The LCI's hog cholera committee is currently headed by Dr. F. J. Mulhern, animal



Hog cholera committee, left to right (second row)—Dr. H. W. Dunne, Dr. James R. Hay, Mr. R. H. Abraham, Dr. Earl J. Splitter.
In the foreground are, left to right—Drs. H. L. Marsh, Francis J. Mulhern, Paul C. Bennett.



Hog cholera committee, continued . . .

Left to right—Mr. Fritz Johnson, Mr. A. Ord Cantwell, Dr. D. P. Gustafson, Mr. Keith Myers, Dr. Richard D. Shuman, Dr. J. P. Torrey.

disease eradication branch, agricultural research division, USDA.

Speakers included on this program were: Dr. Mulhern; Mr. Bernard Collins, hog producer and vice-president, Iowa Swine Producers Association; Mr. M. A. Drisko, Foreign Agricultural Service, USDA; Dr. Howard W. Dunne, Pennsylvania State College; Dr. John Hejl, animal inspection and quarantine division, USDA; Dr. Kenneth Wells, director general of veterinary health, Canada; Mr. Charles Bell, federal extension service; Dr. Harry Geyer, Ohio State University; and Mr. R. Harvey Dastrup, executive director, Livestock Conservation, Inc. The economics of "choosing to live with hog cholera" were presented by both Mr. Collins and Mr. Drisko. Dr. Wells told how Canada has refused to live with the disease, and the remaining speakers told how the disease was eradicated there.

On March 4, a meeting was held in Chicago to consider the various aspects of hog cholera and the possibilities of its eradication. The meeting was conducted by the extension service of the United States Department of Agriculture in cooperation with the hog cholera committee of Livestock Conservation, Inc.

Papers presented dealt with the economics (losses from hog cholera and from restricted exports), epidemiology, virology, immunology, and regulatory phases of hog cholera. Possible procedures to follow if a program of eradication is adopted and those used in Canada were also presented.

The veterinary profession was often a topic of discussion. Veterinarians and commercial interests were accused by a swine producer of being opposed to the eradication of hog cholera because of the economic impact on incomes should immunization of swine cease. This accusation was later repudiated by Dr. Geyer, state veterinarian of Ohio, when he stated that the eradication of hog cholera would demand the services of the profession more than at present, especially in the field of preventive medicine.

Three more regional meetings are planned, after which the Hog Cholera Committee of Livestock Conservation, Inc., will decide on future action if a program of eradication is to be developed.

The meeting indicated that an eradication program will be developed if desired by the various segments of the swine industry and that a concentrated educational program

will be necessary. The American Farm Bureau assured the group that they plan to get an eradication program underway.

Georgia is 24th State to Qualify as Modified-Certified Brucellosis Area

Georgia is the 24th state, the ninth in 1959, to qualify as a modified-certified brucellosis area in the national fight against this costly disease of cattle.

The Georgia certification campaign is being led by Phil Campbell, State Commissioner of Agriculture; Dr. Joseph W. Mann, state veterinarian; and Dr. Chester J. Mikel, USDA veterinarian in charge of animal disease eradication.

In the national campaign to date, 1,825 counties or 57.8 per cent of the total of 3,152 in the United States, Puerto Rico, and the Virgin Islands have achieved certification. At the time of last certification, 156 of the total certified counties reported no evidence of any brucellosis infection.

Announcement of Kimble Methodology Research Award for 1960

Nominations for the ninth Kimble Methodology Research Award are being accepted until June 1, 1960. This award, which gives recognition to the application of scientific knowledge to the Public Health Laboratory, was established by the Kimble Glass Company of Toledo, Ohio (subsidiary of the Owens-Illinois Glass Company), and is sponsored by the conference of state and provincial public health laboratory directors.

The cash award of \$1,000 and silver plaque will be presented at the annual meeting of the conference to be held in San Francisco, Calif., in October, 1960.

Rules Governing Nominations

1—The candidate's work to be considered for nomination should be either:

- a. A fundamental contribution which serves as a baseline for development of diagnostic methods which fall within the province of the public health laboratory.**
- b. The adaptation of a fundamental contribution to make it of use in a diagnostic laboratory.**

2—Candidates for nomination are to be drawn from the United States, its territories, and Canada.

3—Consideration will be given to nominations only if they are covered either by six reprints with six summaries and bibliography or if reprints are not available then six summaries with bibliography will be accepted. A statement which justifies the recommendations of the study must accompany either the six reprints with summaries or the six summaries. (The six copies are needed to facilitate the work of the committee making its selection in a limited amount of time.)

4—Nominations may be made by the authors, their associates, or by others. Documentary evidence, etc., should not be signed by the nominator. The nomination, however, should be accompanied by a letter of transmittal.

5—Nominations received after June 1, 1960, will not be considered for the Kimble Methodology Research Award for the year of 1960 but will be considered for nomination in 1961.

6—Nominations of a piece of work where there is more than one author is permissible. (Note: If such work is selected by the awards committee, division of the cash award shall be arranged between the workers themselves, but the plaque accompanying the cash award shall be suitably inscribed and become the property of the laboratory where the work is done).

7—The publications, summaries, materials, etc., submitted to the nominating committee will not be returned to the sender.

8—Send all nominations to: P. R. Edwards, Chairman, Nominating Committee, Kimble Award, Communicable Disease Center, P.O. Box 185, Chamblee, Ga.

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Among the States and Provinces

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District of Columbia

WASHINGTON—DR. BIERBOWER SUCCEEDS DR. DOSSEY IN POULTRY DIVISION.—Dr. George W. Bierbower (OKL '56), has been named assistant head of the Facilities Section, Inspection Branch, Poultry Division, AMS, in the USDA. He succeeds Dr. William F. Dossey who was recently transferred to Chicago, Ill., as area technical supervisor.

Dr. Bierbower is a native of Masontown, Pa., where he received his public and high school education. He entered service with the U.S. Navy in 1940 and remained in active

service until 1946. He entered general practice in Indiana, after his graduation from veterinary school in 1956.

He began poultry inspection work in 1957 and served as inspector-in-charge and station supervisor in several plants in the



Dr. George W. Bierbower

Dallas area. In 1959, he was transferred to Washington, D.C. as assistant to the head of the Facilities Section, Inspection Branch, Poultry Division, Agricultural Marketing Service, his present position.

Dr. Bierbower is a member of the AVMA and the National Association of Federal Veterinarians.

S/Roy E. WILLIE, Chief, Inspection Branch, Poultry Division.

Illinois

MISSISSIPPI VALLEY—ASSOCIATION ELECTS NEW ROSTER.—The 1960 officers of the Mississippi Valley V.M.A. elected at the Association's 55th annual meeting in Peoria, Nov. 4-5, 1959, are as follows: Drs. Glenn I. Case, Kewanee, president; William P. Hendren, Carthage, president-elect; and Richard C. Williams, Moline, secretary-treasurer.—Ill. Vet. Bull., 14, (Oct.-Dec., 1959): 4.

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CHAMPAIGN—EASTERN ILLINOIS ASSOCIATION'S NEW OFFICERS.—The following officers

were elected to serve the Eastern Illinois V.M.A. at the Association's winter dinner meeting, Dec. 3, 1959: Drs. W. L. Hay, Piper City, president; H. J. Heffernan, Danville, president-elect; and Ray D. Hatch, Urbana, secretary-treasurer.

Dr. R. K. Shideler, Danville, was re-elected the Association's representative to the executive board of the Illinois State V.M.A., for a second term.—*Ill. Vet. Bull.*, 14, (Oct.-Dec., 1959): 4.

Nebraska

LINCOLN—ANOTHER SWINE REPOPULATION CONFERENCE TO BE HELD.—The response to the Swine Repopulation Conference was so great (73 attended and 26 were turned away for lack of space last February 3-5) that another such conference will be held July 20-22.

The program will be practically the same and attendance will be limited to the first 70 who apply.

s/CROSBY HOWE, Correspondent.

Pennsylvania

PHILADELPHIA—U.P. HOLDS CONFERENCE ON DOG'S ROLE IN TRANSMISSION OF HUMAN VIRUS DISEASES.—The School of Veterinary

Medicine and its advisory council on veterinary medical education and research of the University of Pennsylvania held a conference on "Virus Diseases of Dogs and Their Interrelationship to Diseases of Man" at the University Museum on March 3, 1960.

Transmission of diseases among the species has been a concern of preventive medicine for many years. The well known epidemiologic problems associated with rabies, tuberculosis, and leptospirosis have been joined by interspecies relationships of more obscure character.

The dog as a host and reservoir of virus diseases has received much investigation and speculation in recent months. It has been suggested that the dog may play a role in the transmission of human virus diseases and that viruses thought to be native to the animal may have public health implications.

This conference was presented to define and discuss some specific aspects of these problems. It attempted to bring together information that, directly or indirectly, may lend understanding to the basic problems involved in viral zoonotic diseases and to further elucidate the importance of the dog to human health.

Veterinarians who participated in this conference were: Dr. Robert M. Schwartzman, University of Pennsylvania, chairman

New Jersey



Summit, N.J.—Dr. F. Kral, professor of medicine and dermatology, School of Veterinary Medicine, University of Pennsylvania (second from left), examines microscope he used recently in a lecture to the Metropolitan New Jersey V.M.A. at CIBA's sales training center. Dr. Kral, well known veterinary dermatologist, discussed modern developments and methods in treating skin diseases of dogs. With him, left to right, are—Bernard Weiner, M.N.J.V.M.A. secretary; Dr. George Belloff, research veterinarian, CIBA Pharmaceutical Products Inc.; and Samuel Pollack, M.N.J.V.M.A. president-elect.

of the conference; Gerry B. Schnelle, Angell Memorial Animal Hospital, Boston, Mass.—the clinical, immunologic and epidemiologic aspects of canine distemper and infectious hepatitis; J. H. Gillespie, Cornell Research Laboratory for Diseases of Dogs—immunization of puppies with special emphasis on canine distemper; and James E. Prier, University of Pennsylvania—a summary of the conference.

Wisconsin

STOUGHTON—ROCK VALLEY ASSOCIATION HOLDS ELECTION.—At its regular meeting of the Rock Valley V.M.A. on March 2, 1960, the following slate of officers was elected: Drs. G. G. Clefisch, Clinton, president; B. D. Ward, Edgerton, vice-president; R. Pawlisch, Brodhead, treasurer; and T. A. Rude, Jr., Stoughton, secretary.

s/T. A. RUDE, JR., Secretary.

Veterinary Military Service

Foreign News

Switzerland

GENEVA—ANIMALS IN CANCER RESEARCH.—In order to plan cancer research during the next few years and to stimulate further activities in this field throughout the world, the World Health Organization convened a meeting of specialists in Geneva from Jan. 11-16, 1960.

Intensive studies on pathology, epidemiology, etiology, prevention and therapeutics of neoplasms of domestic animals, in the last few years, have thrown much light on the problems of identical and similar diseases in man. The World Health Organization said that while studies on some aspects of these diseases in animals are being carried on in a few countries, it is on a relatively small scale.

Beside attempts to stimulate and expand cancer research, WHO also intends to coordinate the work being done in the veterinary institutions with the work in analogous centers for man. In this way, the maximum benefit can be derived from comparative studies in either discipline.

Graduates of Class in Veterinary Aspects of Nuclear Medicine



U. S. Army Photo

Washington—Walter Reed Army Medical Center.—Shown above are the first graduates of a new course in the veterinary aspects of nuclear medicine held at the Walter Reed Army Institute of Research at Washington, D. C., from Feb. 1-12, 1960.

The course provides training for Army and Air Force veterinarians in the areas of nuclear medicine where their professional skills will be required. Among subjects discussed were radiobiology, radiochemistry, radiopathology, and laboratory examination of foods contaminated with radionuclides. Additional courses will be held periodically, beginning May 9, 1960.

Front row, left to right—are First Lt. R. A. Kuttler; Lt. Col. R. E. Prather, assistant course director; Col. C. S. Snider, WRAIR director of veterinary medicine; Col. M. B. Starnes, course director; Lt. Col. G. W. Vacura; Capt. R. J. Warne.

(Second row)—First Lt. G. F. Orthey; Major W. H. Watson; First Lt. K. E. Kinnaman; Major G. E. Ritter; Major G. M. Grimes; Major R. B. Greiner; Major J. M. Shuler.

(Back row)—Capt. C. C. King; Capt. D. G. Shuman; Lt. Col. G. C. Coburn; Capt. L. R. Hutchinson; Capt. K. L. Kramer; Capt. A. D. Wright; First Lt. H. L. Addis.

Participants in the Second Veterinary Officer Refresher Class,
U.S. Army Medical Service, Meat Dairy Hygiene School—Chicago



U. S. Army Medical Service
Meat and Dairy Hygiene School Photo

Front row (left to right)—Major John J. Naughton, adjutant; Major William A. Bridenstine, instructor; Major Buford F. Bridges, instructor; Col. Marion W. Scothorn, commandant; Lt. Col. John J. Powell, director of training; Major Daniel W. Hubbard, instructor; Colonel Daniel S. Stevenson, V.C.

Second row—Capt. William L. Hays, V.C.; Lt. Col. John M. Holmes, V.C.-USAR; Lt. Col. William G. Phifer, USAF (V.C.); Lt. Col. Karl H. Willers, V.C.; Lt. Col. William D. McMonagle, V.C.; Lt. Col. Charles V. L. Elia, V.C.; Lt. Col. Arthur C. Eldred, V.C.-USAR.

Third row—Lt. Col. James E. Peck, V.C.; Lt. Col. Elmer R. Pede, V.C.; Lt. Col. Val A. Tomayko, V.C.; Major Howard B. Slider, Jr., V.C.; Lt. Col. William Ginn, V.C.; Lt. Col. Carl H. Koll, V.C.-USAR; Lt. Col. Howard C. Poulin, V.C.

Fourth row—Capt. Jim H. Cass Jr., V.C.; Capt. James M. Lyday, V.C.; First Lt. James F. Mock, V.C.; First Lt. Blake W. Blakewood, V.C.-USAR; Capt. Roger W. Baker, V.C.; Major James A. Bell, USAF (V.C.); Major Alexander H. Munson, USAF (V.C.); Major Frederick W. Clayton, USAF (V.C.).

State Board Examinations

ARIZONA—June 22-23, 1960, Arizona State College, Flagstaff, Ariz. Deadline for applications is June 12; the fee is \$25. Dr. William E. Snodgrass, Secretary, 1612 W. Washington St., Phoenix, Ariz.

ARKANSAS—June 16-17, 1960, 2400 East Fifth St., Little Rock, Ark. Telephone # is Franklin 2-5129; the fee is \$10. Dr. David Ibsen, 2400 East Fifth St., Little Rock, Ark., Secretary.

COLORADO—May 31-June 2, Colorado State University, Veterinary Hospital, Fort Collins, Colo. Deadline for applications is April 30; the fee is \$25. Dr. V. D. Stauffer, Secretary, 5500 Wadsworth Blvd., Arvada, Colo.

CONNECTICUT—July 12-14, 1960, Hartford, Conn. Deadline for applications is July 2; the fee is \$50. Dr. Salo Jones, Secretary, Room 285, State Office Building, Hartford, Conn.

HAWAII—Sept. 22-24, 1960, Honolulu, Hawaii. Deadline for applications is Aug. 22; the fee is \$25. Dr. Wilson M. Pang, Secretary, 1683 Kalakaua Ave., Honolulu 14, Hawaii.

ILLINOIS—June 29-July 1, 1960, Chicago office of the Department of Registration and Education, 160 N. LaSalle St., Chicago, Ill. Deadline for applications is June 14; the fee is \$20. Mr. Fredric B. Selcke, Superintendent of Registration, Capitol Building, Springfield, Ill.

INDIANA—July 12-13, 1960, State House, Indianapolis, Ind., at 8:00 a.m. Deadline for applications is 30 days preceding the day of the regular meeting for the applicants applying by examination; 15 days if applying by reciprocity. Those applying for examination, a \$40 fee must accompany the application; for those coming in by reciprocity, the fee is \$50. Dr. Joe W. Green, Secretary Veterinary Examining Board, State Board of Health Building, Room 422, 611 Park Ave., Indianapolis, Ind.

IOWA—May 31-June 1, 1960, Des Moines, Iowa. Applicants must be in the office of the Division of Animal Industry, State House, Des Moines, not later than 8:00 a.m., on May 31. Additional information may be obtained by writing: Dr. A. L. Sundberg, Chief, Division of Animal Industry, State House, Des Moines 19, Iowa.

KANSAS—May 31-June 2, 1960, Dykstra Building, Kansas State University, School of Veterinary Medicine, Manhattan, Kan. Deadline for applications is May 1; the fee is \$10. Dr. Charles W. Bower, Secretary, 1128 Kansas Ave., Topeka, Kan.

KENTUCKY—July 25, 1960, Capitol Building, Frankfort, Ky. Deadline for applications is July 11; the fee is \$25. For Applications and information, write: Mr. William E. Johnson, 319 Ann St., Frankfort, Ky. (A special June examination is usually given; the exact date has not been set.)

MAINE—July 11-12, 1960, Dr. Libby's office, 6th Floor, Office Building, Augusta, Maine. Deadline for applica-

tions is 15 days before the examination. There is a \$20 fee with each application. Dr. E. C. Moore, Secretary, Turner Center, Maine.

MARYLAND—June 6-7, 1960, College Park, Md. Candidates may secure application forms from Dr. Harold S. Gober, Secretary-Treasurer, 5400 Park Heights Ave., Baltimore 15, Md. All applications must be returned to the secretary no later than June 1, 1960. The examination begins promptly at 8:00 a.m.

MASSACHUSETTS—June 22-24, 1960, University of Massachusetts, Amherst, Mass. Deadline for applications is at least one week prior to the examinations date; the fee is \$25. Dr. Edward A. Zullo, Secretary, Board of Registration in Veterinary Medicine, Room 33, State House, Boston 33, Mass.

MICHIGAN—June 20-21, 1960, Lansing, Mich. Examination to be written, practical, and oral. Applications must be on file at least 15 days before the examination, accompanied with a \$25 fee. For application blanks and information, address: Corresponding Secretary, 641 Lewis Cass Building, Lansing 15, Mich.

MINNESOTA—July 12-13, 1960, College of Veterinary Medicine, University of Minnesota, St. Paul Campus, St. Paul 1, Minn., at 8:00 a.m. each day. Deadline for applications is 30 days prior to the examinations; the fee is \$25. Dr. A. C. Spannaus, Executive Secretary, Veterinary Examining Board, Route #1, Waconia, Minn.

MISSISSIPPI—June 21, 1960, Woolfolk State Building, Jackson, Miss. Deadline for the applications is June 11, the fee is \$25. Dr. William L. Gates, Secretary, Box 417, Clarksdale, Miss.

MISSOURI—June 2-3, 1960, Veterinary Clinic, University of Missouri, Columbia, Mo. Deadline for the applications is 15 days prior to the date of the examination; the fee is \$25. Dr. L. A. Rosner, Chairman, Box 630, Jefferson City, Mo.

NEBRASKA—May 9-10, 1960, State Capitol Building, Lincoln, Neb. Deadline for applications is 15 days prior to the examination date; the fee is \$25. Mr. R. K. Kirkman, Director, Bureau of Examining Boards, 1009 State Capitol Building, Lincoln, Neb.

NEW HAMPSHIRE—July 5, 1960, State House, Concord, N.H. Deadline for applications is June 25; the fee is \$15. Dr. J. P. Seraichick, Secretary, Board of Veterinary Examiners, Chesterfield Rd., Keene, N.H.

NEW MEXICO—June 17-18, 1960, State Capitol Building, Santa Fe, N.M. Deadline is two weeks prior to the examination date; a \$25 fee is to accompany applications. Dr. Edwin J. Smith, Secretary, State Board of Veterinary Examiners, P.O. Box 4385, Santa Fe, N.M.

NEW YORK—June 15-16, 1960 (practical), June 28-July 1, 1960 (written), at Ithaca, New York City, Buffalo, Syracuse, Rochester, and Albany, N.Y. Applications must be received 30 days before date of examination; the fee is \$40. Mr. James O. Hoyle, 23 South Pearl St., Albany, N.Y.

NORTH CAROLINA—June 20-22, 1960, Grove Park Inn, Asheville, N.C. Dr. James I. Cornwell, Secretary-Treasurer, North Carolina State Veterinary Examining Board, P.O. Box 9038, Asheville, N.C.

NORTH DAKOTA—Oct. 12-13, 1960, Van Es Building, North Dakota Agricultural College, Fargo, N.D. Deadline for applications is about ten days prior to the examination date; the fee is \$15. Dr. M. C. Hawn, Secretary, N.D. Veterinary Medical Examining Board, 1407-13th St. North, Fargo, N.D.

OHIO—June 6-8, 1960, Sisson Hall, College of Veterinary Medicine, Ohio State University, Columbus, Ohio. Applicants must be present at 8:00 a.m. on June 6. Dr.

H. G. Geyer, Executive Secretary, Ohio Veterinary Medical Board, Ohio Departments Building, Room 720, Columbus 15, Ohio.

PUERTO RICO—Aug. 2, 1960, Division of Examining Boards, Comercio 452, Carrera's Building, San Juan, P.R. Deadline for applications is July 3; the fee is \$10, the license fee is \$5, and one P.R. Revenue Stamp of \$1. Herminio Mendez Herreria, Secretary, Box 3271, San Juan, P.R.

RHODE ISLAND—July 12-13, 1960, Division of Animal Industry, 505 Veterans' Memorial Bldg., 83 Park St., Providence, R.I. Deadline for applications is July 1. Dr. Thomas E. Grennan, Secretary, Providence, R.I.

SOUTH CAROLINA—June 16-17, 1960, Columbia, S.C. Deadline for applications is June 2; the fee is \$25. Dr. H. L. Sutherland, Secretary, P.O. Box 87, Union, S.C., secretary.

TENNESSEE—June 27-28, 1960, Cordell Hull Building, Capitol Grounds, Nashville, Tenn. Deadline for applications is June 25; the fee is \$25. Dr. T. H. Bullington, Secretary, R.F.D. #3, Fayetteville, Tenn.

TEXAS—May 30-June 1, 1960, A. & M. College of Texas, College Station, Texas. The completed application must be received in the Board office not later than 30 days before the examination date. Mr. T. D. Weaver, Executive Secretary, Texas State Board of Veterinary Medical Examiners, 207 Capital National Bank Building, Austin 16, Texas.

UTAH—June 30-July 1, 1960, State Capitol Building, Department of Business Registration, Salt Lake City, Utah. Applications should be submitted to Mr. Frank E. Lees, Director of the Department of Business Regulation and Registration Division, State Capitol Building, Salt Lake City, Utah, by June 15. Registration fee is \$15.

VIRGINIA—June 30-July 1, 1960, Senate Chamber, Capitol Building, Richmond, Va. Deadline for applications is May 30; the fee is \$25. Mr. T. N. Burton, Secretary, P.O. Box 1-X, Richmond 2, Va.

WASHINGTON—May 26-28, 1960, Wegner Hall, College of Veterinary Medicine, Washington State University, Pullman, Wash. Deadline for applications is May 11; the fee is \$35. Mr. Thomas A. Carter, Administrator, Professional Division, License Department, Olympia, Wash.

WEST VIRGINIA—June 20, 1960, Capitol Building, Room E-117 (ground floor of the east wing), Charleston, W. Va. For applications and information, write: Dr. Harry J. Fallon, Secretary-Treasurer, 200 Fifth St. West, Huntington, W. Va.

WISCONSIN—June 27-28, 1960, Madison, Wis. Dr. A. A. Erdmann, Chief Veterinarian, State-Federal Cooperative Program, 6 West, State Capitol, Madison 2, Wis.

WYOMING—June 21-22, 1960, State Office Building (third floor, south wing), Cheyenne, Wyo. Deadline for applications is June 6; the fee is \$25. Dr. G. H. Good, Secretary, State Office Building, Cheyenne, Wyo.

Deaths

John B. Conaway (KVC '16), 65, Minneapolis, Minn., died from emphysema and heart failure on March 30, 1959.

Dr. Conaway began his practice in Hartley, Iowa, spent some time in the Army, and then in 1931 moved to Elk River, Minn., and

later to Anoka, Minn. He continued his practice until 1944, when illness forced him to retire.

Noah J. Elder (OSU '11), 72, Lakeview, Ohio, died Dec. 22, 1959, following a brief illness.

Dr. Elder had been a food and meat inspector in both Lima and Johnson City, Tenn. After retiring in Lima in 1957, he returned to Lakeview. He was a veteran of World War I and a life-member of the Disabled American Veterans' organization.

August J. Engel (GR '17), 73, Frankenmuth, Mich., died Dec. 7, 1959, after a brief illness. A life-long resident of Frankenmuth, Dr. Engel had been in practice there for over 42 years.

John E. Fawcett, 83, Macomb, Ill., died Dec. 10, 1959, after a long illness. Dr. Fawcett had practiced veterinary medicine for 60 years before he retired a few years ago.

Richard W. Grossmann (MCK '13), 75, Belleville, Ill., died from a cerebral hemorrhage, Dec. 8, 1959.

Dr. Grossmann served as county veterinarian for 22 years, before his retirement a year ago. He was a life member of the Illinois State V.M.A.

Harry L. Gurney (MCK '03), 84, San Diego, Calif., died Dec. 11, 1959. He had been a resident of San Diego for 40 years.

Dr. Gurney had been a county meat inspector for the last 20 years of his practice.

Chester O. Johnson (STJ '16), 73, Silver City, Iowa, died Oct. 10, 1959. Dr. Johnson had practiced in Silver City for 43 years.

William B. Lamb, 83, Tulsa, Okla., died Dec. 16, 1959.

Dr. Lamb had received the 52nd veterinary license issued in Indian Territory. At one time, he had been a U.S. deputy marshal at Perry, Okla.

T. A. Monk, Sr. (USC '14), 74, Goldsboro, N.C., died Dec. 17, 1959.

At the time of his retirement from practice four years ago, he was the oldest practicing veterinarian in North Carolina. He was a former vice-president of the North Carolina V.M.A.

Among his survivors is a son who is also a veterinarian, Dr. Timothy Archie Monk, Jr. (AU '42), of Ahoskie, N.C.

Olin T. Murphy (KVC '10), 75, Kirkwood, Mo., died suddenly of a coronary occlusion, Dec. 20, 1959.

Following graduation, Dr. Murphy located in Kahoka, Mo. He conducted a general practice there until 1936. For three years he was employed by the former BAI, working on brucellosis eradication and on federal meat inspection. In 1939, he located at Kirkwood, continuing there until his retirement in 1956.

One son is also a veterinarian, Dr. George L. Murphy (COL '50), of Kirkwood.

Wilson B. Oler (MSU '39), 42, Richmond, Ind., died of cancer, Dec. 23, 1959.

Dr. Oler had practiced in Marion, Hartford City, and Hagerstown.

Harry H. Owen (KCV '10), 72, Vista, Calif., died from a ruptured gallbladder in March, 1959.

Dr. Owen began his practice in Boise City, Idaho, moving to Oakland, Ore., and later to Caldwell, Idaho, until he retired from practice in 1950.

*** J. Fred Park** (AU '12), 77, West Plains, Mo., died Dec. 11, 1959.

Dr. Park entered the former BAI in 1914. He served for various periods at Omaha, Neb.; Kansas City; Sioux City, Iowa; Topeka, Kan.; and finally in West Plains, in 1918. In 1925, he was appointed inspector-in-charge of the virus serum control work, serving until his retirement in 1951. He had declined promotions in order to remain in the Ozark region.

A member of Alpha Psi, Dr. Park was the first president of the Theta Chapter at Auburn (1912).

* * *

OTHER DEATHS REPORTED.—The following deaths have been reported. The usual information for an obituary was not supplied.

William F. Christopher (CVC '10), 81, La Porte, Iowa, died Oct. 23, 1959.

Arthur B. Cottrill, Logan, W. Va., died in November, 1959.

Windsor R. Smith (HAR '98), 87, North Brookfield, Mass., died Dec. 12, 1959.

Women's Auxiliary

Projects and Personalities

Much of the responsibility for the smooth functioning of the AVMA Auxiliary rests upon the capable shoulders of two new executive board members: Mrs. D. A. (Afton) Osguthorpe of Salt Lake City, Utah, secretary; and Mrs. Peter S. (Vera) Roy of Jacksonville, Fla., treasurer.

Mrs. Osguthorpe received valuable experience for her present office by serving as vice-president and then president of the Intermountain Auxiliary and Mrs. Roy has served as treasurer of the Florida Auxiliary for the past four years.

"The most fun-time of our lives was the period at Colorado State University when Dr. Osguthorpe was studying for his D.V.M. degree," Mrs. Osguthorpe recalls. She worked as a secretary to four district extension agents to supplement their income.

Mrs. Roy obtained an M.S. degree in bacteriology from Ohio State University. She now finds herself "involved in more things than 10 people and getting snowed under."

Boating, gardening, photography, and travel are hobbies of the Florida-dwelling



Deseret News Photo

Mrs. D. A. Osguthorpe

Roys. Mountain sports such as horseback riding, hiking, and bobsledding interest the Osguthorpes.

Mrs. Osguthorpe serves actively in her P.T.A. and her church. She has served as district chairman of the American Cancer Society and has helped with the fund drive for a children's hospital for 3 years.

Both Dr. Osguthorpe and Dr. Roy are in private practice.

Iowa

DES MOINES.—Two hundred and fifty women registered for the annual meeting of the Women's Auxiliary to the Iowa V.M.A., Jan. 19-21, 1960, during the State Association's 78th convention.

Mrs. E. E. Leasure, president-elect of the AVMA Women's Auxiliary, was the guest of

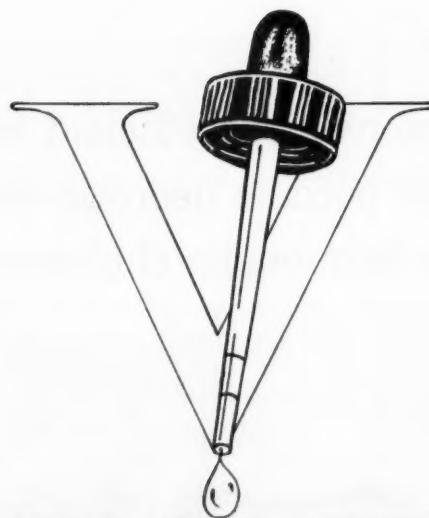
honor. She stressed opportunities for women in professional public relations.

Included among the interesting events of the meeting were: a tour of the Des Moines art center; a musical birthday tea; a luncheon and style show; banquet and dance; and regular coffee hours in the mornings.

Among the attendees at the Women's Auxiliary to the Iowa V.M.A.'s annual meeting in Des Moines last January were five women who are prominent leaders' within their respective organizations.

They are, left to right—Mrs. C. D. Lee, Ames, state auxiliary president; Mrs. E. E. Leasure, Manhattan, Kan., president-elect of the AVMA Auxiliary; Mrs. I. A. Merchant, Ames, president of the Ames Auxiliary; Mrs. G. W. Rieke, Victor, past-president of the state auxiliary; Mrs. LaRoy Bell, Davenport, president of the Eastern Iowa Auxiliary.





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Vitamin D	1,000 units
Vitamin B ₁ (Thiamine Hydrochloride)	1 mg.
Vitamin B ₂ (G) (Riboflavin)	1.2 mg.
Vitamin B ₆ (Pyridoxine Hydrochloride)	1 mg.
Pantothenic Acid (as the sodium salt)	5 mg.
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CLINICAL RESULTS: Field tests^{1,2,3,4} indicate perorally administered FURACIN to be safe and specific for uncomplicated *Salmonella* infections and necrotic enteritis of swine and beneficial in other nonspecific enteric conditions of swine. Controlled laboratory studies^{5,6} demonstrate that FURACIN Water Mix in drinking water for 7 consecutive days prevents mortality and aids in maintaining normal growth of pigs infected 2 days prior to treatment.

METHOD: Add FURACIN Water Mix to the drinking water in proportions of 330 Gm. (1 carton) to each 36 gallons. Continue medicated water for at least 7 days.

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SUPPLIED: Carton of 330 Gm. Available from your professional veterinary distributor.

REFERENCES: 1. Vickers, C. L.: Personal communication. 2. Filion, R., and Trepanier, M.: Personal communication. 3. Lannek, N., and Brag, S.: Vet. Med. 49:75-78 (Feb.) 1954. 4. Felgate, C. A., and Swann, H. C.: Vet. Rec. 68:259-262 (May 5) 1956. 5. Guthrie, J. E.: Vet. Med. 47:307-314 (Aug.) 1952. 6. Guthrie, J. E.: Personal communication.

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Fig. 1 — Medial (left) and anteroposterior radiographs of the swelling above the metacarpophalangeal joint of the colt.

History.—A 3-year-old Thoroughbred colt injured its left foreleg one year previously. There was little lameness but some swelling just above the metacarpophalangeal joint. Medial and anteroposterior radiographs were taken (fig. 1).

Here Is the Diagnosis

(Continued from preceding page)

Diagnosis.—Longitudinal fracture of the distal third of the left metacarpal bone (fig. 2).

Comment.—There is a vertical fracture extending from the junction of the middle and distal thirds of the large metacarpal bone into the fetlock joint just lateral to the intercondylar ridge. Little callus is evident.

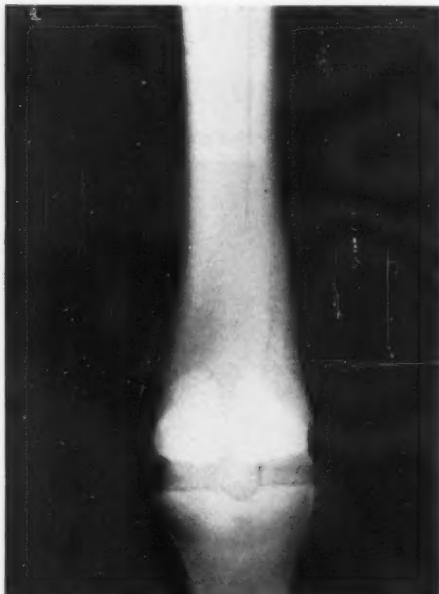


Fig. 2 — Anteroposterior radiograph of fetlock of the Thoroughbred colt.

This report was submitted by William D. Carlson, D.V.M., Ph.D., radiologist, College of Veterinary Medicine, Colorado State University, Fort Collins.

Our readers are invited to submit histories, radiographs, and diagnoses of interesting cases which are suitable for publication.

Quiz for Quidnuncs

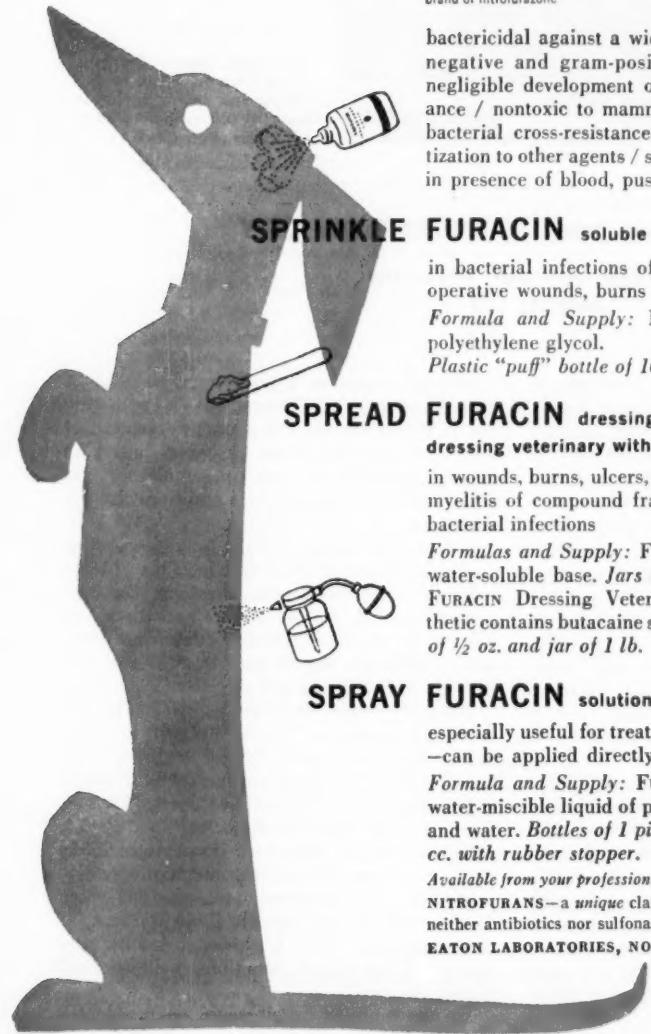
1. How effective is cyanethydrazole as a treatment for lung-worms in swine? Page 368.
2. How long has the causative agent of chicken sarcoma been preserved by desiccation? Page 377.
3. What tolerance do pet birds have to local anesthesia induced by procaine? Page 379.
4. What species of domestic animal is most seriously affected by *Salmonella dublin* infection? Page 386.
5. What four methods of livestock slaughter are considered humane? Page 389.
6. What effects may human beings experience as a result of eating flesh from animals that have been exposed to nuclear "fall-out"? Page 395.
7. What percentage of AVMA presidents and executive board members have been practitioners? Page 400.

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bactericidal against a wide range of gram-negative and gram-positive organisms / negligible development of bacterial resistance / nontoxic to mammalian tissue / no bacterial cross-resistance / no cross-sensitization to other agents / stable and effective in presence of blood, pus, milk, serum



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in bacterial infections of the eye and ear, operative wounds, burns

Formula and Supply: FURACIN 0.2% in polyethylene glycol.

Plastic "puff" bottle of 10 Gm.

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in wounds, burns, ulcers, pyodermas, osteomyelitis of compound fractures, secondary bacterial infections

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especially useful for treating painful lesions — can be applied directly or with atomizer

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The State Capitol Building at Denver, 5,280 feet above sea level, giving the city the nickname of "Mile-High City."

DENVER — 1960 CONVENTION CITY

97th Annual Meeting
August 14-18

Denver, Colorado, the 1960 convention city, is the hub metropolis of the Rocky Mountain Empire and one of the nation's youngest, highest and fastest-growing cities.

At the time of the 58th annual meeting of the AVMA in Denver in 1921, the city's population was 270,000. In 1959, there were 825,000 people living in the metropolitan area and new residents arriving at an estimated rate of 2,000 per month.

The west steps of the State Capitol Building in Denver are 5,280 feet above sea level, giving the city its nickname of the "Mile-High City." From a low of 3,300 feet near the Kansas-Colorado line, the state rises to 14,431 feet at the top of Mount Elvert near Leadville, Colo.

Fifty-four Colorado peaks soar higher than 14,000 feet, while in the entire nation, there are only 15 other 14,000-foot peaks. Average elevation of the state is 6,800 feet.

The elevation and proximity of the mountains give the Denver area a comfortable summer climate. Average noon-day temperature is 84.4 F. with a relative humidity of 30 per cent during August. The city cools quickly after sunset for comfortable sleeping.

Denver began as a gold town in 1858 at the confluence of Cherry Creek with the South Platte River. The economic growth of the city since that time has been based on mining, agriculture, tourism, wholesale and retail trade and commercial and financial institutions.

The modern skyline of the downtown area, the pleasant residential districts, the distant vista of mountains, the western costume seen frequently on the streets and the white federal government buildings reinforce Bernard DeVoto's suggestion that Denver is the "most cosmopolitan" of cities.

Denver's transportation facilities and hotel accommodations help to make it an ideal convention city. Seven major airlines, railroads, and U.S. highways, including 3 interstate roads, provide easy access to Denver from all parts of North America.

There are 30 first-class downtown hotels in Denver, and 250 motels and highway hotels. The city's newest hotel, the 880-room Denver Hilton, will be the headquarters for this meeting. The business sessions and many of the social functions will be held here.

In addition, 18 hotels have been selected

as official hotels for the meeting. A map showing hotel locations in relation to the city auditorium is on p. 46 of the advertising section, facing a registration blank with additional hotel information.

Because Denver is a popular summer vacation city and a large attendance is anticipated for the AVMA meeting, early registration is recommended.

Awards Administered by AVMA —Nominations Invited

Members of the AVMA are invited to submit nominations for the following Awards to be administered by the AVMA in 1960. Formal presentation of these Awards will be made at the AVMA's Ninety-Seventh Annual Convention in Denver, Colo., August 15-18.

Deadline and Rules for Submission of Candidates

Nominations for any of the Awards administered by the AVMA should be submitted to the Committee on Awards, AVMA, 600 S. Michigan Ave., Chicago 5, Ill., not later than May 15, 1960.

Each nomination should contain a brief account of the nominee's accomplishments and qualifications for the Award in question, as well as a short biographical sketch of his professional background and experience. For further details on each Award, see the summaries listed below.

AVMA Award

This Award is designed to recognize distinguished members of the Association who have contributed to the advancement of veterinary medicine in its organizational aspects. Veterinarians who have exerted outstanding leadership in the building of stronger local, state, or regional associations or have contributed to the improvement of the national organization are eligible.

Classifications for AVMA Award winners are: (1) active members who are in practice; (2) active members who are in educational, administrative, public health, or research activities; (3) scientific exhibits in comparative medicine whether it be at meetings of the AVMA, meetings of other na-

tional associations, or at national exhibits, such as world fairs.

A gold medal and a certificate are presented for categories (1) and (2); for category (3) a suitably inscribed certificate is awarded.

Below is a list of former AVMA Award winners:

1943—John R. Mohler	1955—C. W. Bower
1950—L. A. Merillat	1956—Col. R. J. Foster
1951—A. H. Quin	1957—O. H. Person
1952—Adam A. Husman	1958—Brig. Gen. J. A. McCallum
1953—George W. Gillie	1959—J. G. Hardenbergh
1954—N. J. Miller	

Borden Award

The Borden Award is given in recognition of "outstanding research contributing to dairy cattle disease control." It was instituted by the Borden Company Foundation in 1936, to stimulate research and to recognize achievements in the fields of chemistry, biochemistry, human nutrition, animal physiology and genetics, dairy production and manufacture, pediatrics, and related sciences.

A nominee for the Award must have published the results of his work in recognized scientific journals. The AVMA Awards Committee furnishes the Borden Company Foundation with a pertinent bibliography of the proposed recipient's published work, as well as the candidates qualifications.

The Award consists of a gold medal and \$1,000. Following is the list of past recipients:

1944—I. Forest Huddleston	1952—Ralph B. Little
1945—W. L. Boyd	1953—George H. Hart
1946—W. E. Cotton	1954—M. G. Fincher
1947—Jacob Traum	1955—H. E. Kingman, Sr.
1948—A. F. Schalk	1956—Herbert L. Gilman
1949—R. R. Birch	1957—Samuel H. McNutt
1950—James Farquharson	1958—Chester A. Manthei
1951—L. A. Klein	1959—Peter Olafson

Gaines Award

To foster progress in small animal medicine and surgery, the Gaines Dog Research Center annually offers the Gaines Award and Medal to a veterinarian whose work (within the preceding 5 years) in either clinical research or the basic sciences is judged to have contributed significantly to the advancement of the field.

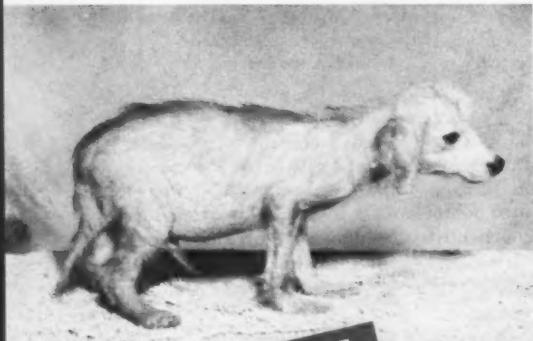
Each nomination should include a description of the work performed, its contributions to small animal medicine and surgery, a

(Continued on adv. p. 42)

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1. "Clinical Evaluation of a Drug for Dermatoses of Dogs and Cats," Wenger, J. B., Vet. Med., 55:55-58, Mar. 1960.

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History of the AVMA

At the semi-annual meeting held in Boston, a major topic of interest was the recent outbreak of foot-and-mouth disease at Portland, Maine, in cattle imported from England. R.S. Huidekoper, who was elected a member at the meeting, offered a resolution: "That it be the opinion of this Association . . . that the United States quarantine authorities are, through carelessness and incompetency, responsible for the spread of the infection."

This may seem like harsh criticism for a group of men in Boston to give to their colleagues in Maine, but at least it was made in the presence of G.H. Bailey, Maine commissioner on contagious diseases. Earlier, Dr. Bailey had reported in the *Review*: "The herd was inspected on board ship by U.S. Commissioner Thayer, and being pronounced free from disease, were allowed to land. Instead of being transported by cars, the animals were driven over the public highway through Portland and Deering to their destination." After the cattle were placed in quarantine, several mild cases of foot-and-mouth disease, first diagnosed as "foul-in-the-foot," broke out, and a number of cattle which had been driven over the same trail contracted the disease.

Drs. Melvin and Mohler, in recounting the history of foot-and-mouth disease in the United States, state that this outbreak was "comparatively insignificant . . . and restricted to only a few herds, so that the dissemination of the virus was quite easily controlled." This experience, however, did result in the adoption of more stringent regulations and was the last outbreak of foot-and-mouth disease as a result of importation.

For the first time in the history of the Association, the annual meeting was not held in Boston or New York but at the Grand Hotel in Cincinnati. J.H. Detmers, a newly elected member, moved that the *American Veterinary Review* be made the official organ of the Association, but C.B. Michener "strongly condemned any such action on the part of the Association, and held it to be unwise to make any journal the official organ of an association that knows no special school or set of men. . . . This sentiment was heartily endorsed, and Dr. Detmers cheerfully withdrew his motion."

Dr. Liautard urged "that veterinarians be compelled to report all cases of contagious diseases," but Dr. Detmers objected, "unless the State first recognized the veterinary sur-

geons." Liautard then offered a resolution, which was carried, that the USVMA "suggest the obligation on the part of veterinarians and veterinary practitioners to report to the proper authorities every and any case of contagious disease he may meet in his practice, in the same manner as the human practitioner is obliged to do in his specialty, under the liability of penalty for punishable offenses."

The officers of the previous year were re-elected, except that L.H. Howard of Boston was made vice-president. About the only concession to "western" veterinarians was the enlargement of the Board of Censors from five to seven—to include John Meyer, Sr., of Cincinnati and W.J. Crowley of St. Louis. The secretary's salary was increased from \$20 to \$50 a year.

In a paper entitled "What we have been—What we may become," D.V. Dixon noted the failure of the Association to double its original membership of 40 in 20 years "in the face of more than a thousand practitioners in the country at the present time." This, he observes: ". . . gives ground for the charge that has sometimes been advanced, viz.: that while the institution was respectable, and contained many leaders of the profession in this country, it is lethargic and approaching decline."

* * *

WILLIAM B. E. MILLER, D.V.S., 12th president of the USVMA, was born in 1840. In 1879 he was graduated from the American Veterinary College. He traveled hundreds of miles to demonstrate the standing operation for castration and his technique with cryptorchid horses. He was a trustee of the American Veterinary College, one of the first inspectors of the BAI, president of the New Jersey VMA, and president of the USVMA from 1883-1885. He died in 1905.

A scene in Cincinnati in 1884.

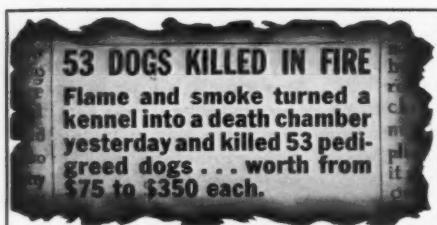




Dr. John S. Sickles Joins Schering Staff

John S. Sickles (COR '51) has been appointed to the Veterinary Medicine Department of Schering Corporation where he will be responsible for maintaining close contact with independent veterinarians studying new veterinary products.

Prior to joining Schering, Dr. Sickles was associated with small animal hospitals in New City, New York, and in New York City. He has also been associated with the Department of Pathology and Bacteriology in the New York State Veterinary College at Ithaca.



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(Continued from adv. p. 39)

pertinent bibliography, and suitable biographic information.

The work of the nominated veterinarian should be known either by publication in recognized veterinary periodicals and/or by presentation at professional meetings.

Since 1957, the following veterinarians have received the Gaines Award:

1958—Frank Kral

1959—Wade O. Brinker

Practitioner Research Award

Established in 1955, this Award was proposed by the AVMA Research Council to encourage clinical research in veterinary science by veterinary practitioners.

The plaque signifying the Award is presented to a practitioner who has carried out the major portion of an important phase of a research problem and has published the results *while engaged in practice*. Former recipients of the Award are:

1956—Wayne H. Riser 1957—W. E. Magrane

1959—Edwin A. Churchill

Twelfth International Veterinary Congress Prize

The Executive Board, serving as a committee on awards, recommends that recipients of this Award be selected on the basis of contributions to veterinary science that are international in scope. This would include recognition of outstanding service by veterinarians in countries other than the United States and Canada, as well as veterinarian in this country who have contributed to international understanding of veterinary science.

Established in 1936, the Award consists of a certificate and a cash presentation. Former Prize winners are:

1937—Denny H. Udall	1948—A. E. Cameron
1938—George H. Hart	1949—Gerard Dikmans
1939—John R. Mohler	1950—Nelson S. Mayo
1940—I. Forest Huddleston	1951—R. S. Sugg
1941—Adolph Eichhorn	1952—Charles E. Cotton
1942—Brig. Gen. R. A. Kelner	1953—L. Van Es
1943—Otto Stader	1954—F. W. Schofield
1944—D. F. Luckey	1955—B. T. Simms
1945—L. A. Merillat	1956—Hadleigh Marsh
1946—T. H. Ferguson	1957—Edward Records
1947—W. J. Butler	1958—Harry W. Schoening
	1959—William H. Feldman

COMING MEETINGS

Notices of coming meetings must be received 30 days before date of publication.

American Animal Hospital Association. Annual convention. Statler-Hilton Hotel, Boston, Mass., April 19-22, 1960. Frank R. Booth, 3920 E. Jackson Blvd., Elkhart, Ind., executive secretary.

Florida, University of. Third annual conference for veterinarians. University of Florida, Health Center Auditorium, April 30—May 1, 1960. W. R. Pritchard, Head, Department of Veterinary Science, University of Florida, Gainesville.

Pennsylvania, University of. Annual conference for veterinarians. School of Veterinary Medicine, University of Pennsylvania, Philadelphia, May 3-4, 1960. W. H. Rhodes, program chairman.

Kansas State University. Twenty-second annual conference. School of Veterinary Medicine, Kansas State University, Manhattan, May 19-21, 1960. Donald C. Kelley, chairman.

Mississippi State Veterinary Medical Association, Inc. Annual meeting, King Edward Hotel, Jackson, June 19, 1960. Joseph W. Branson, P. O. Box 4223, Fondren Sta., Jackson, Miss., secretary-treasurer.

North Carolina Veterinary Medical Association. Fifty-ninth annual summer meeting. Grove Park Inn, Ashe-

ville, June 21-23, 1960. J. T. Dixon, 3026 South Main St., Winston-Salem, N.C., secretary-treasurer.

California Veterinary Medical Association. Seventy-second annual meeting. Jack Tar Hotel, San Francisco, Calif., June 26-29, 1960. Mr. Ken Humphreys, 3004 16th St., San Francisco 3, Calif., executive secretary.

Virginia Veterinary Medical Association. Summer meeting. Shoreham Hotel, Washington, D.C., July 17-19, 1960. G. B. Estes, State Office Building, Richmond, Va., secretary-treasurer.

Kentucky Veterinary Medical Association. Forty-ninth annual convention. Sheraton-Seelbach Hotel, Louisville, July 18-19, 1960. L. S. Shirrell, 545 East Main, Frankfort, Ky., secretary.

Nebraska, University of. Conference on Swine Repopulation. University of Nebraska, College of Agriculture, Agricultural Experiment Station, Lincoln, July 20-22, 1960. Inquiries should be directed to: Dr. Crosby Howe, Department of Animal Pathology and Hygiene, University of Nebraska, Lincoln 3.

Auburn University. Fifty-third annual conference for veterinarians. School of Veterinary Medicine, Auburn University, July 24-27, 1960. J. E. Greene, dean.



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American Veterinary Medical Association. Ninety-seventh annual meeting. Denver-Hilton Hotel, Denver, Colo., Aug. 15-18, 1960. H. E. Kingman, Jr., 600 S. Michigan Ave., Chicago 5, Ill., executive secretary.

Indiana, Central Indiana Veterinary Medical Association. Annual symposium on small animal medicine, Indianapolis, Ind., Sept. 14, 1960. L. Bruce Horrall, Mooresville, Ind., secretary.

Foreign Meetings

International Association of Veterinary Food Hygienists Second Symposium. Basel, Switzerland, May 15-21, 1960. Dr. A. Clarenburg, 1, Sterrenbos, Utrecht, The Netherlands, president.

International Congress of Physio-Pathology of Animal Reproduction and Artificial Insemination. Amsterdam, Netherlands, June 13-17, 1960. Dr. J. Edwards, Milk Marketing Board, Thames, Surrey, England.

First International Congress of Endocrinology. Technical University of Denmark, Copenhagen, July 18-23, 1960. Dr. Christian Hamburger, Statens Serum Institut, Copenhagen S, Denmark, chairman of the executive committee.

Second International Course on Lyophilization. Lyon, France, Aug. 29—Sept. 9, 1960. For full details, contact: Dr. Louis R. Rey, Directeur des Cours Internationaux de Lyophilisation, Laboratoire de Physiologie, Ecole Normale Supérieure 24, rue Lhomond, Paris 5, France.

Fourth International Congress on Animal Reproduction. The Hague, Netherlands, June 5-9, 1961. For additional information contact: the Secretariat of the Fourth International Congress on Animal Reproduction, 14, Burghemeester de Monchyplein, The Hague, Netherlands. Dr. L. Hoedemaker, secretary to the organizing committee.

Eighth International Congress of Animal Husbandry. Hamburg, Germany, June 13, 1961.

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BREED
SEX
AGE
WEIGHT
HISTO

1: Canine Breed: English Cocker
2: 7 yrs.
3: 35 lbs.
4: Vomiting and diarrhea (bloody), anorexia
5: Gastritis
6: Treatment if any: none
7: DIATHAL Dose: 1 cc.
8: Vomiting and diarrhea stopped promptly;
9: given 2nd day; appetite returned, fed
10: and beef; on 3rd day normal stool, normal
11: Ito.



SYMPTOMS:

This report covers about 23 cases treated as outpatients

DIAGNOSIS:

PREV: Recently I have been treating many dogs as outpatients whose complaints are low-level anorexia (from moderate to severe). Major loss of size and weight I usually note each dog, 1 cc. of DIATHAL i.m. While I did not have the opportunity to check many cases on a follow-up, I had telephone reports on most and the results were almost universally good, i.e., the number of bowel movements usually decreased by 75% in 24 hours. I had no complaints of any toxic or

TREAT:

PO: 1 cc.

IM: 1 cc.

SE:

RE:

PRO:

DR:

TR:

PO:

IM:

SE:

RE:

DR:

TR:

PO:

IM:

MAP OF DOWNTOWN DENVER



HOTEL INFORMATION—DENVER, COLORADO, CONVENTION

Ninety-Seventh Annual AVMA Meeting, Aug. 14-18, 1960

All requests for hotel accommodations will be handled by a Housing Bureau in cooperation with the Denver Convention and Visitors Bureau. The Bureau will clear all requests and confirm reservations.

Hotel and Rate Schedule

(See Location, by Number, on Map of Downtown Area)

Map No.	Hotel	Single (1 person)	Double bed (2 persons)	Twin bed (2 persons)	Suites	Sets-2 rooms connecting bath (2-3-4 persons)
1	Adams*	\$5.50-7.50	\$ 7.50-9.00	\$ 8.50-10.50	\$13.50-15.00	\$ 9.50-16.00 (1 Room, 2dbl. beds)
2	Albany†	6.50-9.50	10.00-12.00	12.50-14.00	30.00	-----
3	Ambassador	5.50-6.00	7.00-7.50	9.00	-----	-----
4	Argonaut*†	6.50-9.50	8.50-11.00	9.50-12.50	-----	13.50-17.50
5	Auditorium*	5.00	6.50	7.00	-----	8.00-12.00
6	Broadway Plaza†	8.00-10.00	10.00-12.00	12.00-14.50	18.00-28.00	-----
7	Brown Palace†	9.00-15.00	13.00-17.00	14.00-19.00	22.00-70.00	18.00-22.00
8	Colorado*	4.50-6.00	6.00-10.00	8.00-12.00	-----	14.00-20.00
9	Cory	5.00-7.00	6.00-9.00	6.50-9.00	-----	-----
10	Cosmopolitan*	8.50-11.00	12.00-18.00	14.00-20.00	22.00-60.00	-----
11	Hillview	9.00-11.50	10.00-12.00	12.00-13.50	16.00-18.00	-----
12	Hilton*†	HEADQUARTERS HOTEL — Reserved exclusively for official convention use.				
13	Kenmark (not a/c)	4.50-6.50	6.00-7.00	7.50-8.00	-----	6.00-12.00
14	Mayflower*	7.50-14.50	8.50-16.50	12.50-18.50	-----	-----
15	Olin*	5.00-7.00	9.00-11.00	10.00-12.00	-----	11.00-16.00
16	Oxford	5.00-10.00	6.50-10.00	8.50-11.00	13.00-16.00	-----
17	Sears	5.00-6.00	6.50	7.50	-----	14.00 (For 2-3-4 persons)
18	Shirley Savoy*	7.00-9.00	9.50-11.50	11.00-13.00	25.00	15.00-19.00

†100 per cent air-conditioned; in other hotels listed, majority of rooms air-conditioned.

***FAMILY PLAN**—The above hotels offer a "family plan" whereby children under 12 years of age will be accommodated in the same room with their parents at no extra charge. If more than one room is required to accommodate children, the hotel will charge only the single rate for each room.

MOTELS—Reservations for motels in the Denver area may be made through the Denver Convention and Visitors Bureau, 225 West Colfax, Denver 2, Colo.

PLEASE USE APPLICATION ON REVERSE SIDE FOR HOTEL ACCOMMODATIONS

Application for Hotel Accommodations

1960 AVMA Convention — Denver, Colorado

The Convention and Visitors Bureau will make every effort to place you according to your expressed wishes or, if the accommodations of your choice are not available, the Housing Bureau will select one that is nearest to the preferred rate and location.

Please give us the complete information requested below. At least four choices of hotels, or more if you desire, are necessary. Arrange for double occupancy of rooms wherever possible; only a limited number of single rooms is available.

Date _____

Hotel First Choice
Hotel Second Choice
Hotel Third Choice
Hotel Fourth Choice

Room with bath for one person. Rate per room desired \$ to \$

Room with bath for persons. Rate per room desired \$ to \$

double bed twin beds

Two rooms with connecting bath for persons: Rate per set desired \$ to \$

Suite with bedroom(s) with bath for persons: Rate per suite desired \$ to \$

Check here if you desire accommodations on the FAMILY PLAN.

Arrival date , hour A.M. P.M.

Departure date

If reservations cannot be made in one of the hotels indicated shall we place you elsewhere? Yes No

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Reservations will be confirmed directly to those who return this form and it should be received not later than July 25, 1960

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PERSONAL WANT ADS—\$4.00 for the first 25 words and 10 cents for each additional word; 35 cents for use of box number.

TOTAL WORD COUNT must include complete box number address (7 words) or personal address line.

COMMERCIAL WANT ADS—\$5.00 for the first 25 words, 25 cents for each additional word; \$1.00 for use of box number. (See paragraph above for total word count.)

Remittance must accompany ad.

DEADLINES

1st of month issue — 8th of month preceding date of issue.

15th of month issue — 22nd of month preceding date of issue.

Names of classified advertisers using key letters can not be supplied. Address your reply to the box number, c/o JOURNAL of the AVMA, 600 S. Michigan Ave., Chicago 5, Ill., and it will be sent to the advertiser.

Wanted—Veterinarians

Wanted—veterinarian for small animal hospital in Los Angeles-Inglewood area. California license required. Give experience, qualifications and salary desired. Address Dr. Robert Mercer, 6020 S. Corn-ing Ave., Los Angeles 56, Calif.

Wanted—veterinarian to live at Shelter. Nice living quarters. Would prefer retired person and wife who could accept smaller salary. Address Cheryland Humane Society, Traverse City, Mich.

Wanted—veterinarians with graduate training in pathology, physiology and pharmacology for positions in an industrial laboratory active in biology and cancer research. Address Box D 9, JOURNAL of the AVMA.

Wanted—Michigan licensee, capable of assisting in AAHA hospital. State age, experience, availability, salary expected, and other qualifications. Address Pattersons' Dog and Cat Hospital, 3800 Grand River, Detroit 8, Michigan.

DVM position open for field inspector of livestock and poultry. \$559-616 a month. Excellent retirement plan. Apply for Veterinary Inspector at County Personnel Dept., 403 Civic Center, San Diego, Calif.

Wanted—experienced veterinarian for mixed practice in fast-growing Southwestern city. May run as own business. Possible lease within a year. Address Box D 38, JOURNAL of the AVMA.

Wanted—experienced assistant for small animal hospital in Ohio. Give qualifications, availability, salary expected in first letter. Address Box D 36, JOURNAL of the AVMA.

Wanted—experienced veterinarian with Maryland license to operate small animal hospital in June, July, and August. Excellent salary plus commission. Can lead to more permanent arrangement. Address Box D 32, JOURNAL of the AVMA.

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CITY _____ STATE _____

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For Sale or Lease—Practices

For sale—Illinois general practice, established 20 years. Price \$25,000; includes house, garage, office, equipment, drugs, and office furniture. \$5,000 to handle. Address Box S 34, JOURNAL of the AVMA.

For sale—small animal practice in southern California. No real estate, good lease terms, 50-cage capacity, attractive net income. Price below year's net. Address Box C 17, JOURNAL of the AVMA.

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For sale—suburban Indiana mixed (equine and small animals) practice gradually converting to small animal. Unusual opportunity. Package deal—low cash investment—high returns. Home, hospital and frontage for expansion. Address Box C 38, JOURNAL of the AVMA.

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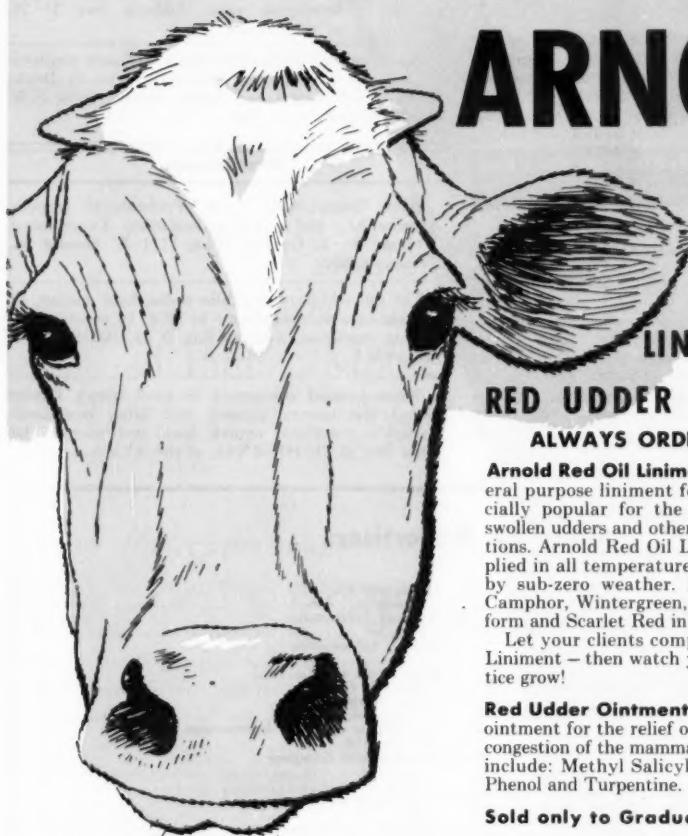
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